The
Electrical Review

VOL. CXXI NOVEMBER 26, 1937. No. 3131

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, SEDIST, LONDON." Code, A B C. Telephone No.: Waterloo 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

Classified Advertisements-Official Notices-Tenders—Supp. 23.

Index to Advertisers—Page xl.

Principal Contents:

	PAGE
The Electrical Fireside	731
Load-building at Hull	733
Street Lighting. By John W. T. Walsh	736
The Domestic Hearth. By H. H. Berry	738
Cardiff Engineering Exhibition	739
Activities at Witton	741
The Production of Batteries	743
Meetings and Discussions	744
Correspondence: Domestic Refrigeration Sales Efforts; On the Gold Coast; East Ham Sub-station Fire; Earth Leakage Trips	747
New Apparatus and Devices	748
Electrical Presents for Christmas	749
A New Domestic Appliance Showroom	751
Business and Industrial Notes	752
Electricity Supply	756
Contract Information	759
Notes	760
Our Personal Column	761
Financial Section	762
Published Specifications	765
New Work for Contractors	766

The Electrical Fireside

HOWEVER monotonous and even irritating the word "psychology" may have become to some people because of the free and easy way in which it slips from the tongue in all sorts of connections, it is unquestionably a term of immense significance in relation to the attitude of the householder whom we wish to induce to change over to electrical methods.

The wintry snap of last week-end drove hundreds of thousands of British families to "gather round the fire," so it will be quite timely for us to think, as Mr. Herbert Berry does on a later page of this issue, of the psychological influences which have led to the very large use that is being made of electrical reproductions or imitations of the coal fire.

No electrical man or woman needs to be reminded of the advantages that the electric fire in any shape or form is bringing to householders in such matters as cleanliness, smallness of space occupied, portability, labour-saving and an easing of the servant problem, but the particular merit of the electrical coal fire is that it reproduces something of the atmosphere of the fireside without adding to the very costly smoke and grit nuisance of our towns and cities.

The great advances that have been made in the electric fuel fire as the result of imagination and inventive ingenuity, certainly bring it far nearer to the common need; anybody who once felt that he was being childishly gulled by an imitation could not help changing his view in the presence of the latest examples that have been placed upon the market. Minds are ceaselessly at work upon the many problems arising from the desire for constant improvement. Unfortunately, we still lack those complete exhibition facilities in the metropolitan area which will keep the public acquainted with the constant advance in merit and in variety of such electrical products. Visits to individual showrooms and local electrical exhibitions meet the need to some extent.

It was as long ago as 1916 that the first electric-coal fire was introduced by Mr. Berry. What remarkable strides have been made in those twenty-one years! It is estimated that since 1916 as many as a million such fires have been brought into service in the United Kingdom, and the various makers are giving a remarkable output at the present time, one concern alone being responsible for as many as 800 per week.

It is stated by leading authorities that the advent of this form of fire, in its many varieties, has been responsible, because of its popular appeal, for a greater output from the grid than any other domestic appliance. The electricity supply companies which are working in association as well as the large power companies are being greatly assisted in their efforts to secure the domestic load. This is so because it is becoming more widely recognised that the electrical ideal, as Mr. Berry says, is "to give the public something equally as attractive as the coal fire."

Much might be written regarding the psychology of electrical illumination and electric driving of machinery, but we have thought it desirable to concentrate for the moment upon a special section of domestic development in which the opportunity is great and should be greater still during the progress of the next few years.

Profitable Audacity

ELECTRIFICATION on the Paris-Orlèans and Midi railways was in some cases adopted as a "technical necessity" Mr. A. Bachellery informed the I.E.E., but he left no doubt in the minds of those present that the policy of the two amalgamated companies that has been "criticised for its audacity has proved a profitable investment." This policy has not only produced a lower ratio of expenses to receipts than on any other railway in France, but it has also made France the most active country in railway electrification during the past

few years, taking into account projected schemes. Conditions are, of course, not quite on all fours in Great Britain and any quantitative details that Mr. Bachellery can give in his communicated reply that will help British engineers to draw comparisons on a weighted basis would add much to the value of the qualitative aspects of his paper. Among the questions that suggest themselves are those relating to the costs of power delivered at sub-station d.c. busbars from the hydro-electric and steam stations, operating wages and maintenance per train-mile and gradients on lines of heavy traffic. Heavy gradients and a long tunnel were dominating factors in the decision of the L.N.E.R. to electrify the Manchester-Sheffield main line for which overhead equipment contracts have now been placed.

Gas Cushion Cable

EVIDENCE of the remarkable advances made in cable technique over the last few years is afforded by the internationally valuable series of tests being undertaken at 150 kV at Arnhem, Holland. The thickness of the dielectric of the Henley gas-cushion cable, which has been on continuous test there for the last nine months at 260 kV is comparable with that of the normal mass-impregnated cables operating in Great Britain at 66 kV. The latter also represented a big step forward from anything that had gone before.

The Public Lighting Engineer

IT will be clear from a perusal of the Final Report of the Departmental Committee on Street Lighting that the successful application of its technical recommendations will depend very much upon the man on the spot. No point in the article that Dr. J. W. T. Walsh contributes to this issue merits greater attention than the emphasis he gives to the importance of the recommendation that "a whole-time specialist should be appointed in the case of the larger or more important areas." It is to be hoped that this recommendation will be implemented to the fullest possible extent.

Fulham's First Year

DURING its first twelve months of operation, the new Fulham power station, which was opened on September 26th, 1936, has generated 557,610,000 kWh at an overall plant load factor of 61.56 per cent. and a station load factor of 48.44 per cent. Fuel consumption per kWh generated worked out at 0.947 lb. of coal with a calorific value of 12,815 B.th.u. per lb. giving a thermal efficiency of 28.13 per cent. As the amount of coal burned, 235,641 tons, included that required for the drying out of boilers and lagging and the inevitable losses incurred in the tuning up of new plant, the new station is doing remarkably well. The figures have not been equalled by any station in Great Britain in its initial stages and, indeed, only Battersea and Dunston B. have returned better figures on a kWh generated basis at any time. It also speaks well for the reliability of the plant, since the first set ran for 7,246 hours and the second set, which was put into commission later, for 6,702 hours, during the period.

Overhead Line Handicaps

AN indirect consequence of the long distances usual between water-power stations and load centres was mentioned by Mr. J. L. Eve in his chairman's address to the I.E.E. Transmission Section. To this he attributed the rapid development of overhead lines in many other countries as contrasted with the initially almost exclusive use of underground cables in Great Britain, where the proximity of coal and water to industrial districts resulted in the erection of generating stations in congested areas where overhead work had obvious disadvantages. Such schemes as that of the overhead distribution from the Grosvenor Gallery in 1887 were exceptional for many years. Mr. Eve absolved the Board of Trade from the charge that the onerous character of its Regulations hindered developments at a later stage. Rather he attributed the tardiness to difficulties in obtaining wayleaves and showed by a lantern slide how markedly the number of compulsory wayleaves dropped after the grid came into being—truly an unexpected result from the erection of the once unpopular "pylons."

Fire Prevention

ARRANGEMENTS for segregating electrical plant for the purpose of reducing risk of fire must, of course, cover auxiliary gear and connections included in the unit. In a letter this week Mr. R. Weaving, manager of the British Electric Transformer Co., states that the fault at East Ham grid sub-station on November 4th started in external connections and that there was no fault on the transformer, as the borough electrical engineer believed to be the case from the data available. Whatever further investigations may disclose as the ultimate cause of the fire, the need to guard against outbreaks of this kind and to prevent trouble on one part of a unit involving apparatus associated with it is a part of the general technique of protection against fire and its consequences.

Interior Lighting Standards

THE Australian *Erda* reports that a committee of experts has been formed within the Standards Association of Australia to evolve practical standards for the illumination of buildings such as factories, libraries, schools and commercial premises. It is further hoped that the activities of this committee may be extended so that a code covering domestic illumination requirements may be formulated. The difficulties with which the committee will have to contend are obvious, but if practical results emerge from its deliberations they will be of considerable interest in this country, for so far little has been done in this direction here. The average property owner in Australia is described as having become "light sub-conscious." In England E.L.M.A. and E.D.A. are still working to produce this effect in the minds of property owners and residents in the Home country.

Power Stations and Air Raids

EXTENSIONS of large generating stations are referred to in the correspondence columns of *The Times* as giving a "richer prize" to hostile aircraft. This question is an old one and has for some time past engaged the attention of the Minister for the Co-ordination of Defence, who recently approved the additions to Battersea station, for instance. Most of the new plant is required to meet local growth of load, since selected stations are usually in or near thickly-populated centres, which would be better defended against aircraft than isolated spots, and actually increase the potential stand-by from the grid, assuming that this stand-by can be fully utilised. It is not so much a matter of technical efficiency as of space limitations that decides the location of plant, and in physical size there is not so very much to choose between the larger and the "smaller" stations. Moreover, the latter, if isolated, would be out of commission for a very long time if incapacitated by a well-placed bomb. An official statement of the position might, however, allay any public anxiety on the subject.

Compulsion

THE subject of compulsory wiring rules and registration of contractors and/or operatives is a perennial one. At almost every gathering of contractors it is discussed and the conclusion is unanimously reached that "something ought to be done about it." The matter is receiving particular attention just now from the Association of Supervising Electrical Engineers as the result of the presentation of the report of a Committee which the Association set up last year. This Committee reviewed the schemes in force in the Dominions and outlined one for this country. Meetings have been held in a number of towns at which the matter has been discussed and a resolution passed proposing the formation of an "electrical industry committee" to prepare a scheme for submission to the Minister of Transport.

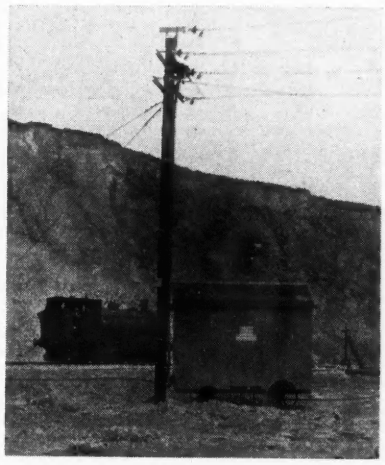
Load-building at Hull

An undertaking's faith in load diversity

Although industrial electrification is proceeding apace, the domestic load has made a more rapid advance

DIVERSITY of industry and trades is an outstanding feature of the life of Hull which probably has a bearing on the importance of that city as one of this country's principal ports. Mr. J. N. Waite, general manager and engineer of the electricity undertaking, and various members of his staff all recently talked to us forcibly of the value of attaching sufficient importance to the influence of load diversity in selling electricity. We believe that a relationship could be shown between the general and electrical diversities referred to.

Within the greater area of 161 sq. miles (373,000 population) there is a densely populated city area with 314,000 inhabitants and, broadly, two types of outer area—urban and sparsely populated. Grouping of seven districts only in each of the last two mentioned types gives a fairly accurate idea of the whole and the bearing on diversity. The urban group has a total population of 32,511, the possible and actual consumers being 11,528 and 8,390 respectively. The total population of the other group is 2,854, while the possible and actual consumers are 743 and 396 respectively. The amounts of energy sold in the two groups last year were 9,200,000 kWh and 388,000 kWh respectively.



The portable control hut in a chalk quarry and on the right is seen the electrically operated excavator

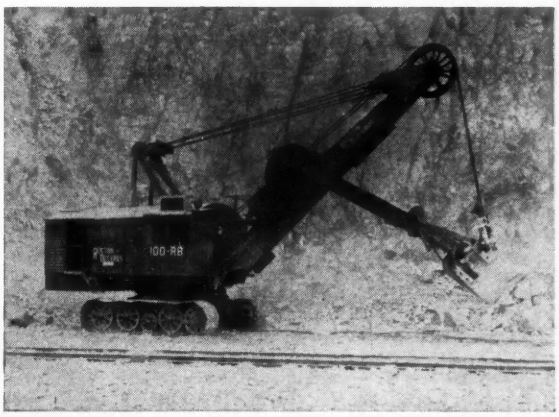
The following consumptions and demands of a few of the industries indicate the widely varying conditions: Aeroplane manufacture, 1.3 million kWh and 700 kW; starch-making, 4.4 million kWh and 3,000 kW; cement industry, 21.1 million kWh and 4,500 kW; engineering, 10 million kWh and 5,100 kW; fish-meal manufacturing, 2.6 million kWh and 485 kW; oil mills, 11.1 million kWh and 5,074 kW; paintworks, 1.6 million kWh and 1,391 kW; docklands, 9.9 million kWh and 5,656 kW; tramways, 5.3 million kWh and 1,440 kW.

The total amount of energy sold last year by the undertaking, excluding public lighting, was 193.3 million kWh. While the percentage of this sold to large power consumers decreased from 69.15 in 1932 to 60.63 in 1937, the actual amount of energy sold increased from 77.4 million kWh in 1932 to 117.2 million kWh in 1937. The explanation is found in the growth of the domestic output and the domestic and commercial heating and cooking output. In 1932 the domestic supply percentage was 13.08 (14.6 million kWh), while in 1937 the figure had increased to 24.17 (46.7 million kWh). In 1932 the domestic and commercial heating and cooking percentage was 13.24 (14.8 million kWh) and in 1937 this figure had grown to 27.23 per cent. (52.6 million kWh).

Left: A Beverley shipyard with a load of 300 kW. Right: A special l.v. feeder pillar with instrument panel partly swung open

Diversity is, of course, the basis of all general tariffs, but it also governs group tariffs. A particularly strong example of this is commercial-building supply, in which case the heating and cooking supplies are ignored from the point of view of maximum demand. Cooking and heating are charged for at ½d. per kWh as unrestricted supplies, while heating is available at ½d. per kWh on a restricted supply and at ¼d. per kWh on a night-load basis.

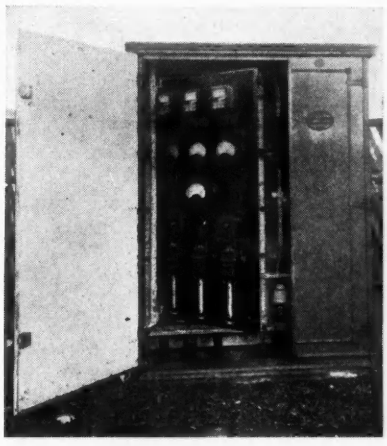
The following examples show the effect of consumers' own individual diversity on the average price per kWh obtained under a two-part tariff. A large commercial stores had a lighting and power consumption of 283,075 kWh and a cooking consumption of 61,491 kWh. The average prices obtained were: lighting and power 1.15d. per kWh, cooking 0.5d. per kWh and overall 1.03d. per kWh. The lighting and power, heating and cooking consumptions of a large cinema and café were 396,725 kWh, 628,530 kWh and 181,615 kWh respectively, the average prices being 0.679d., 0.245d., and 0.286d., respectively, the overall average price to this consumer working out at 0.394d.



The Domestic Problem Settled

Mr. Bellamy (deputy commercial manager) asserts that Hull has "settled the domestic problem." His claim is based largely on the establishment of the case for domestic diversity.

For this purpose the Sutton Trust housing estate was subjected to tests over three years. The whole estate is supplied from one sub-station, so that it was possible to obtain accurate records of the necessary loadings. Each house, with its cooker, wash-boiler and lighting, has an installed capacity of 9 kW, and 5 kW is taken as representing the individual consumer's maximum demand. Thus the potential maximum demand is 2,500 kW. To take the test figures for one year only (1936) the maximum demand at the generation peak was 98 kW, which shows a diversity of 25.5.



The maximum demand on the local distribution peak was 325 kW, which gives a diversity

of 7.7. The load factors on the generation and local peaks were 48.75 per cent. and 14.7 per cent., respectively.

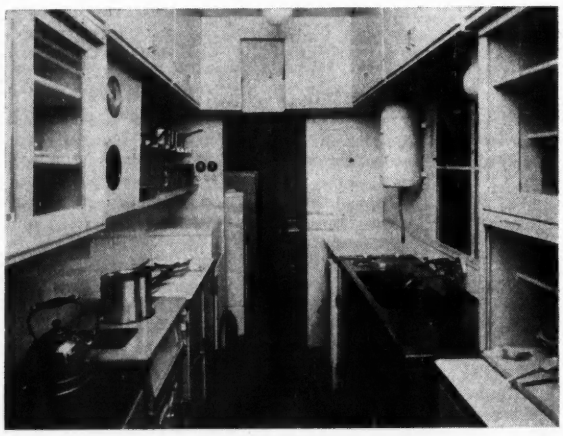
The standing charge for the whole estate (15 per cent. of the rateable value) was £936. The 457,500 kWh sold brought in a total running charge (¼d. per kWh) of £953, so that the total revenue was £1,889. The total expenditure, including the generation, capital, transmission and other fixed charges of £1,379, as well as the running costs of £333, totalled £1,712. The profit of £177 thus proved the case for domestic electrification to the undertaking's satisfaction.

It is as well to make it clear what is meant by the case for domestic electrification. Lighting and cooking are definitely included on an all-electric basis; water-heating in conjunction with a fuel-fired system is encouraged because the fire creates diversity and keeps the load off the peak, while the electric fire is regarded as mainly an occasional-use equipment because 85 per cent. of the domestic consumers are rated as low as up to £15 and therefore cannot be regarded as space-heating consumers on a permanent basis. The £30 house can be and is catered for on such a basis satisfactorily by the use of convectors and tubes. There are now about 17,500 cookers, 17,000 kettles, 6,000 wash boilers, and 1,750 water heaters.

The relationship between diversity and tariffs is given greater significance by Mr. Waite's strong belief that it is the undertaking's duty to charge at the nearest possible figure to the cost per kWh. And this line of thought has no doubt led to flexibility in the tariffs. Apart from the fact that there are no fixed tariffs for the larger consumers, the idea is also reflected in the "restricted non-restricted" tariff. Under this a consumer pays a fixed charge of £2 10s. per kVA of maximum demand during off-peak hours and £3 10s. per kVA of maximum demand during peak periods. This tariff was introduced as the result of negotiations for the supply to a whiting factory, and it turned the scales from a balance in favour of Diesels.

The Next Problem

Commercial-space heating, however, is quite another story and is regarded as the next problem to be mastered. Judging from what we saw we should say the prospects are very good. Five cinemas—Regal (Hull), Rex, Regis, Royalty and Regal (Beverley) have seating capacities of 2,515, 1,045, 1,045, 1,045 and 950 respectively. In the Regal (Hull) an electrode boiler serves a plenum system and the major heating is on from 10 a.m. to 11 p.m. for over 200 days of the year, while in all the other cases direct heating is employed with an extract only, and the buildings are in use every week-day evening and three afternoons per week. The 1936 consumption and maximum demand figures respectively are 628,530 kWh and

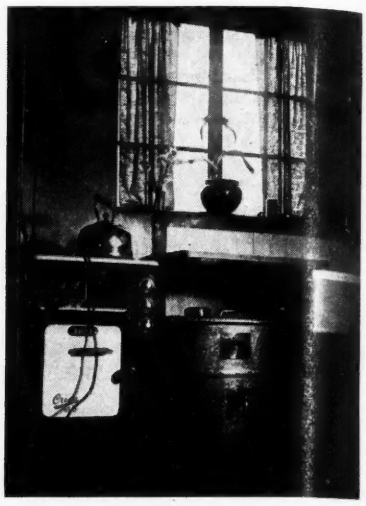


The model kitchen at the Ferensway showrooms

384 kW; 111,566 kWh and 149 kW; 133,786 kWh and 143 kW; 81,277 kWh and 149 kW; 116,376 kWh and 182 kW.

There are thermal-storage installations at the undertaking's showrooms, a Corporation garage, a block of commercial offices and shops and the Regal Cinema, which have building volumes of 650,000 cu. ft., 357,000 cu. ft., 177,000 cu. ft., and 726,250 cu. ft. respectively. The buildings were all heated for about 5,500 hours during the year ended March, 1936, when the average temperature rise was 19 deg. F. in all cases except the garage, for which it was 14 deg. F. The annual consumptions were, respectively, 447,244 kWh, 515,973 kWh, 298,440 kWh, and 659,963 kWh.

Perhaps the next most important load-building work which is at present going on at Hull is in connection with commercial fish and chip frying. Fish is cheap, and fish-and-chip meals are frequently indulged in by a large portion of the populace. Out of a total of about 300 fish-and-chip shops, fifty or so are regarded as potential consumers and twenty have already been secured. The first fish-fryer was installed in 1934 after members of the supply undertaking's staff had turned themselves into fish-frying experts and demonstrated "all out" and under adverse criticisms for several consecutive nights. Mr. W. E. F. Cluff, one of the "converts," told us, with great enthusiasm, how, by reason of the uniform temperature consequent upon automatic control, he is not paying more for electricity than he paid for coal and how the time saved by the elimination of recovery time when rebanking with coal had resulted in quicker



The interior of a house on the Sutton Trust estate

service. He could now supply his customers with a much nicer commodity with consequent increase of business goodwill. The fact that his shop does not now require painting so often and that his overalls remain clean for longer periods is also of great value.

Of the twenty installations eleven are converts from coal, six from gas and three are new installations. The average annual consumption per fish-frying range is 30,000 kWh, so that at ½d. per kWh an ultimate revenue of over £2,000 per annum is aimed at. The probable maximum simultaneous demand will be 1,666 kW, but the hours of the fish-frying business automatically restrict this demand during the time of the Department's generation peak.

Evidence of the business-getting activities in commercial cooking is provided by the number of first-class installations now giving satisfaction in the area. The 94 kW of equipment belonging to the Co-operative Society serves a public restaurant with a seating capacity of 300 and produces daily 200 lunches and 200 to 250 teas. Among the equipment are three 6-kW roasting ovens, a 5-kW steaming oven, a 14-kW two-pan fish-fryer, a 10-kW six-plate boiling table and a 7-kW hot cupboard and bain marie.

A Tour of the Area

The flair of Mr. Shuttleworth (deputy engineer) for organising a lightning tour is almost equal to his ability to impart quick-fire information on the move. We left the city boundary at Haltonprice on the main York Road, on our way to Beverley, having passed the North Hall housing estate on the left where the undertaking serves 4,300 houses. A glimpse of the supplementary catchment drain which is being designed to increase the circulating water for Sculcoates reminded us that load-building has its influence on generation, while a similar lesson in connection with distribution was a mile length of low-voltage line of ribbon-building developments.

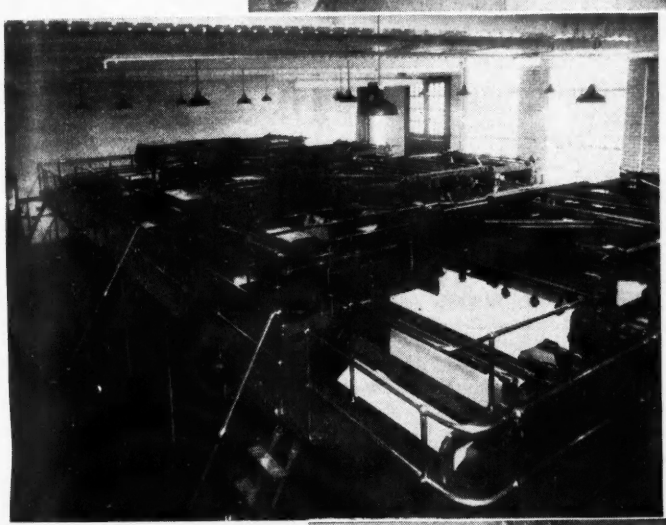
A Dutch gardener nearby has many acres under glass devoted to the intensive cultivation of tomatoes and spring greens. This represents a new industry in the district and the value to the undertaking lies in the large-scale pumping *via* an overhead network of pipes. A few miles north-west, at Woodmansey, we saw some more of the difficulties brought about by ribbon building. There are two or three miles of underground cable with a "bit of power" right at the extremity. But boosting has proved a satisfactory remedy.

A few minutes brought us to Beverley with its population of 15,000, main industries of shipbuilding, tanning and rope-making, and its 3,000-kVA of sub-station capacity. Supply is taken direct from the 22-kV overhead system and transformation is direct for local supplies. But for the bulk supply to the Buckrose undertaking step-down is effected at the central sub-station for secondary transmission at 11 kV. Beverley possesses two fine churches in St. Mary's and the 11th-century Minster. Heating, lighting and organ-blowing are responsible for a 200-kW demand in St. Mary's, but so far there is only organ-blowing in the Minster. A short easterly deviation from our route landed us into a scene of activity in the shipyard of Cook, Welton & Gemmell on the River Hull, where 300 kW is demanded by air compressors, welding equipment and machine tools. This works was changed over to public supply only a few years back.

Another deviation in the opposite direction gave us a glimpse of the Queen's Gate Whiting Works, where hauling chalk out of a 128-ft. pit, crushing, elevating and drying, are responsible for an annual consumption of 250,000 kWh. On the road to Skidby, travelling south again, we passed the barracks of the 4th East Yorks Regiment, the subject of a recent successful "attack" by the undertaking, and a mental hospital where the present 50-kW demand represents the gradual change over to date from gas for lighting and heating. At Skidby we went into a genuine old-time windmill where two 10-h.p. motors are engaged in the supplementary work of cutting and mixing grist. These operations demand more regular speed than the rolling and grinding carried out by the windmill proper.

Near Willerby it seemed a pity to see a mere 15-kW pole transformer for an isolated farm supply so soon after Mr. Shuttleworth had told us that 50-kW transformers were now a drug in the market.

A sharp turn to the west brought us to Swanland, one of the first villages to be electrified. Its original 50-kW supply has now grown to 200 kW. When we saw it a pumping station right in the middle of the village had only been operating electrically for a few days. An oil engine has been replaced by a submersible pump 320 ft. deep. The 16-h.p. motor runs at 2,900 r.p.m. and is controlled by a float switch in the nearby overhead reservoir.



Still going west, we came to a large cement works just before Welton. At a quarry about a mile from the works there is a Ruston-Bucyrus electric digger with a 200-h.p. motor-generator set serving, separately, three d.c. motors with Ward Leonard control. From a step-down substation a 3,000-V supply is conveyed to the face *via* a Y branch line whose two terminal poles are advanced with the face. The digger is served by means of a trailing cable by a Reyrolle gate-end mining switch in a portable hut. A cable box connection on the pole is completely disconnected from the line when the hut is moved. At the main works 4,000 kVA of transformer plant is installed, shortly to be increased to 5,000 kVA. The works and quarry combined are responsible for a consumption of over 20 million kWh per annum.

Brough was the most westerly point we touched and here 2,000 kW of transformer plant is employed in the production of heavy seaplanes and general aircraft by Blackburn Aircraft, Ltd. Following the Humber on the road back to Hull we passed an orphanage where 200 children are catered for by electric cookers.

Brief visits to a few of the larger city industrial consumers certainly supported our impressions of diversity. In the *Daily Mail* printing offices four large modern presses have a.c. commutator motor drives, and the 6,600-V switchgear in the substation is remotely controlled from the distribution room. At the hydraulic pumping-station of the L.N.E.R. four 700 h.p., 6,600-V motors serve for gate, hoist and crane operation on the docks. The machines run up automatically and in themselves present an excellent example of individual consumer's diversity. At the Harrow Street sewage pumping-station a 300-h.p. vertical motor pump looks like being the thin end of the wedge. It was installed last year to assist the four 150-h.p. steam-engine sets.

At the works of the National Radiator Co., Ltd., six sub-stations with 4,250 kW of transformer and rotary plant serve the machine shops, mechanical foundry and welding equipment. The mass-production joinery works of Tarran Industries, Ltd., is well worth a visit by any electrical man, if only for the display of modern individual drives.

The four incorporated drives of a multi-cutter moulding machine run at 6,000 r.p.m., and the necessary frequency-changer is also an integral part of the machine. The twenty-five cutters of a fascinating dove-tailing machine are cam operated.

Above: Albion Street sub-station. Left: The machine room of the Hull "Daily Mail." Below: The L.N.E.R. electrically-operated pumping station

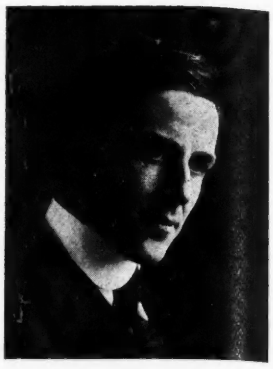
In another factory devoted to the production of all sorts of wooden handles there are machines with speeds as high as 25,000 r.p.m.

Another works deals almost exclusively with drop-forging work and produces thousands of spring stampings for the automobile industry. The demand here is 165 kVA, and the works recently ceased to generate part of its supply. The executive is relieved by the change-over.

An evening tour left us with the impression that there is "something of everything" in public lighting. We saw a good deal of discharge lighting on the main roads, but the undertaking does not appear to have yet arrived at a definite

Street Lighting

By John W. T. Walsh, M.A., D.Sc., M.I.E.E.



[*Elliott & Fry.*
Dr. Walsh

IN 1934 the then Minister of Transport, Mr. Oliver Stanley, appointed a Committee to advise on the improvement of street lighting from the point of view of the convenience and safety of traffic. The membership of this Committee included a public lighting engineer, a county engineer and a borough engineer as well as technical specialists in illumination and departmental representatives, the chairman being Major F. C. Cook, C.B., Chief Engineer (Roads Department) in the Ministry.

In order that new and improved schemes of public lighting should not be held up until the conclusion of the Committee's work, an Interim Report was issued in September, 1935, to give guidance as to the direction in which the Committee's final recommendations might be expected to tend. This Interim Report dealt not only with the technical aspects of the subject, but made certain recommendations on matters administrative, particularly as regards the desirability of making the lighting of all the more important thoroughfares the responsibility of larger administrative units than is commonly the case at present. Mention was also made of the suggestion that there should be grants from national funds towards the cost of lighting certain roads. The Committee, in its Final Report, which was published at the beginning of this month, endorses all that it previously said on this subject and it further points out that the Minister of Transport has now been empowered by the Trunk Roads Act of 1936 to light certain roads on his own authority.

The author discusses the technical aspects of the Final Report of the Departmental Committee

The Committee, in arriving at its technical conclusions, made use of certain sources of information in addition to the experience of the members themselves. In the first place, evidence was submitted by all the principal technical organisations closely concerned with the subject of street lighting; secondly, a questionnaire was issued to lighting authorities throughout the country and, finally, the Committee itself carried out a considerable amount of experimental work, principally on a trial installation specially erected for the purpose on Lonsdale Road, Barnes. It also made a large number of inspections of existing installations in London and elsewhere.

Classification of Roads

In the Interim Report the Committee confined technical recommendations to those roads (termed "traffic routes") which "form the main approaches to or traverse important centres of population, or pass through detached built-up areas, and on which there is appreciable pedestrian traffic." In the Final Report roads in this class now defined as "roads on which the standard of lighting should provide an ample margin of safety for all road users, without the use of headlights by motor vehicles" are dealt with in one section under the heading "Group A," and "all other roads which the responsible authority considers should be lighted" form "Group B" and are dealt with in a separate section. As the Committee is careful to point out, the classification cannot be a hard-and-fast one and the onus is on the lighting authority to decide to which group any particular thoroughfare properly belongs, interpreting the Committee's intentions in the light of local traffic conditions. Mention, too, is made of the necessity for giving due consideration to probable future developments which may lead, for instance, to a road changing from Group B to Group A within a fairly short space of time.

Traffic Routes

The minimum mounting height for the units and the maximum spacing recommended for thoroughfares in Group A are respectively 25 ft. and 150 ft., as in the Interim Report. The latter figure is an average for any given length of thoroughfare, as it is recognised that insistance on a uniform spacing would not assist in the attainment of good street lighting, but rather the reverse. At the same time, unduly long spacing in certain spans is to be avoided and an absolute maximum of 180 ft. for any one span is therefore laid down. A closer spacing than that recommended, *e.g.*, 120 ft., will be advantageous where it can be adopted.

The mounting of lamps over the carriageway, rather than over or behind the kerb, is always a matter which calls for careful consideration. Frequently it is necessary to compromise between excellent visibility at the kerb accompanied by a dark lane down the centre of the carriageway and a more uniform lighting of the carriageway achieved by some reduction in the visibility of objects on or near the kerb. Much depends on the width of the carriageway and the Committee recommends what is, in effect, an overhang graded according to the width between the kerb lines. The distance between the two rows of sources, one on each side of the road, should not exceed 30 ft., and if the carriageway is no wider than this there should be no overhang. For widths up to 40 ft. the overhang naturally increases to a value of 5 ft. For still wider roads any attempt to secure adequate lighting at the centre by increasing still further the amount of overhang should generally be abandoned and instead the lamps at the sides of the road should be mounted over the kerbs and supplemented by additional lamps over the centre line of the carriageway at intervals not exceeding three times the spacing adopted for the side-mounted units. There are

---

Load-building at Hull (*Concluded from previous page*)

policy in this respect. Obviously, the metal-filament lamp is still in good favour. Many well-lighted roads have 500-W "Wembley" lanterns, and the absence of globes in many streets was particularly noticeable. Top refractor units are employed in these cases and considerable importance is attached to the light absorption by globes as soon as they get only slightly dirty.

Influence on Distribution

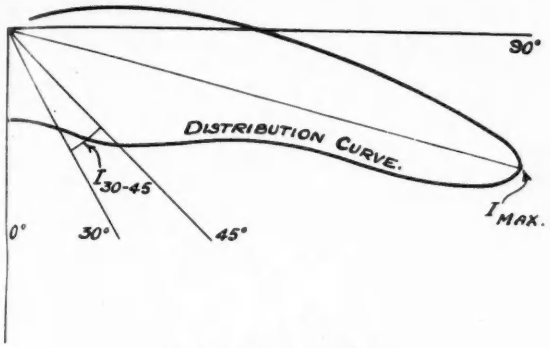
The load-building influence on the distribution system is indicated mainly by the superimposition of 22,000 V on the 6,600-V network. Two feeders will shortly be in commission for this purpose, stepping down at two selected points. "Plangeo" sub-station (Plane Street and St. George's Road) is one of these points where a 5,000-kVA transformer is now being installed and the 75,000-kVA rupturing-capacity switchgear is being changed to switchgear of 250,000-kVA rupturing capacity A third 22,000-V feeder will be run out eastward next year.

The 22,000-V transmission by underground cable to Welton in the West has been incorporated in a ring by overhead transmission through the rural area *via* Cottingham, Skidby, West Ella, Swanland and Welton. This has been extended to Southcave practically at the boundary. There is a spur off this ring to Beverley, and spurs from the City system to the urban areas. Transmission eastwards is at 6,600 V, but at King George Dock there is a step-up to 11 kV for transmission out to Hedon where the undertaking "hands over" to the South-East Yorkshire Company. At Sutton in the north-east there is another step-up to 11 kV and another "hand-over" to the S.-E. Yorks Co. at Rise.

There is already a load of 7,000 kW to 8,000 kW on the 22-kV system. Before the recent generating station extension there were three banks of step-up transformers at Sculcoates. These will now be used for stepping-down at the points of superimposition, and the two new 15,000-kVA transformers at the works will take care of any balance of load between the 22-kV and 6.6-kV systems either by step-up or step-down. Load growth is exerting a marked influence on the rate of progress in changing over from d.c. to a.c. in the original area, but the d.c. boundary is gradually receding, while internal attack is continually being made by the establishment of a.c. sub-stations at key points within the d.c. area. The policy is to have as many sub-stations as conveniently and economically possible, so as to get close to the consumer with high voltage and to reduce low-voltage distribution to the absolute minimum. All this, of course, spells death sooner or later for the supervisory controlled d.c. stations.

certain exceptional cases where an overhang of between 5 and 6 ft. may be permitted.

The siting of units is, perhaps, the most difficult matter of all to deal with by way of recommendation as it is probably here more than in any other factor in street lighting that the result obtained depends on the experience of the engineer responsible for the design of the installation. Apart from such well-recognised principles as the desirability of avoiding single-side lighting except at bends, and the advantage of mounting units on the outer edges of curves, lighting engineers of wide experience are not unanimous as to the best way to arrange the units along a street. The Committee has confined its recommendations to the avoidance of central suspension except for narrow roads fronted by light-coloured buildings and, perhaps, in the case of fittings with the "cut-off" type of light distribution, and considers the staggered



Light distribution ratio

arrangement the most suitable for general adoption on straight roads.

Without making rigid recommendations paras. 46 to 50 give a good deal of general guidance on matters of siting, referring particularly to the problems presented by road junctions and roundabouts. They conclude with the valuable piece of advice that "the final positions of the sources should be decided only after inspection of the site by a competent lighting engineer and with due regard to local traffic conditions."

Power of Light Sources

With regard to the amount of light to be provided, it might perhaps have been expected that the Committee would recommend a certain figure with, perhaps, fairly wide tolerances. It points out, however, that the roads falling within the "traffic route" category are of widely differing characteristics, and it therefore mentions a wide range of values of lumen output "from which an appropriate value can be selected for the lighting of any particular type of road." The range is actually from 3,000 to 8,000 lumens per 100 ft. length of roadway for roads not exceeding 40 ft. in width. These figures, it should be noted, refer to the luminous output *from the lanterns* and represent average values taken over the life of the actual source.

Calculating what these figures mean in actual practice, taking the two types of electric lamps in common use for street lighting at the present time, for a spacing of 150 ft., the lumens to be provided from each unit lie between 4,500 and 12,000. Assuming that, in the case of the fittings used for filament lamps, about two-thirds of the light from the source is emitted from the lantern, this means that the lamps used should be of such a rating as to give between 6,750 and 18,000 lumens. Lamps in the British Standard Specification which fall within this range are the 500-, 750- and 1,000-W ratings, giving respectively (at 230 V) 7,500, 12,000 and 16,800 lumens (average throughout life). In the case of discharge lamps, if 60 per cent. of the light from the source be emitted from the lantern, the range of lumens required is 7,500 to 20,000, so that the 400-W and the 250-W lamps, giving initially about 18,000 and 9,000 lumens, fall within the range recommended. Naturally, smaller ratings of either type of lamp can be used by reducing the spacing of the units.

With regard to the manner in which the light from the lanterns is distributed the Committee does not, of course, recommend any particular type of light distribution curve, but it points out the two principal objects at which designers ought to aim, *viz.*, (*a*) the production of as high a brightness contrast as possible between objects on the roadway and the background against which they are seen and (*b*) the avoidance, or at any rate the limitation, of glare. In this connection a ratio is used which also figured in the Interim Report, *viz.*, "The ratio of the peak candle-power to the average values in all directions downward from the source and lying between 30 and 45 deg. from the vertical." (Referring to the figure, this is the ratio $I_{max}/I_{30\text{-}45}$). The recommended maximum value for this ratio is 6 in the case of non-axial distribution and 5 when the peak direction is parallel to the roadway, with an expressed preference for a value not exceeding 5 in all cases. This recommendation should do much to discourage the use of fittings with a highly concentrated longitudinal beam directed up and down the roadway.

Roads Other than Traffic Routes

It will be remembered that Group B contains all the lighted roads which do not fall into Group A. The diversity is, therefore, considerable, but no doubt a large proportion of these roads are of a residential character. Further, while in the case of Group A roads the Committee considers that the lighting should be such as to make the use of headlights unnecessary (and, therefore, presumably undesirable in the interests of other road users) in the case of the roads in Group B the matter is left entirely to the discretion of the individual driver. It is clearly important, therefore, that the distinction between the two types of road shall be, as far as possible, unmistakable to drivers.

One immediately noticeable feature of any lighting installation is the mounting height of the units, and the Committee therefore recommends that for roads in Group B this height should not exceed 15 ft. Too low a mounting is, of course, objectionable for technical reasons and a lower limit of 13 ft. is laid down with an expressed preference for the higher value. The spacing recommended is 120 ft. on the average with an absolute maximum of 150 ft. for any single span. Closer spacing, *e.g.*, at 100 ft., is recommended wherever practicable on economic grounds. Kerb mounting and staggered formation are advocated, and the range of luminous output for roads in Group B is 600 to 2,500 lumens per 100 ft. length of roadway.

With regard to distribution and glare, the recommendation is that some of the light should be directed towards the lower parts of the buildings fronting the road (for police purposes) and that the ratio of candle-power (defined as in the case of traffic routes) should never exceed 4. With an axial distribution it should not exceed 3, and this value is, actually, a preferred maximum for all cases.

Other Recommendations

A number of other recommendations deal with such matters as adequate maintenance, the gradation of lighting where it passes from one standard to another, as, for example, at a road junction, the size of lamp columns, the provision of artificial background, the lighting of passages for police purposes, the illumination of street nameplates and guard posts on refuges. All-night lighting of street lamps is definitely recommended by the Committee.

A section of the Report (paras. 69 to 73) deals with the lighting of dual carriageways which are now steadily increasing in number and the lighting of which is, therefore, a matter of growing importance. In view of the comparative novelty of the problem certain tentative recommendations are put forward pending further investigations and the accumulation of more experience.

The Committee deal with the difficult question of the proper course to be followed where the existing lighting of a thoroughfare, though satisfactory in many ways, does not in all respects conform with the recommendations contained in the Report. Its views may be summarised as follows: (*a*) A road which falls within Group A should either be improved to the standard recommended for that Group or, if it be at present below the standard recommended for Group B, it may, as a temporary measure, be raised to that standard. It should *not* be brought up to a standard *intermediate* between those recommended for the two groups. (*b*) If the mounting height of a traffic-route installation is somewhat less than 25 ft. (*e.g.*, 22 ft. or over) the installation should not be replaced on that account alone. Further, an existing installation with an overhang not exceeding 6 ft. need not be modified to conform with the fuller recommendations contained in the Final Report.

Further Progress

The full benefit of the Committee's work can only be obtained by the enthusiastic co-operation of all concerned in the provision of public lighting, and in this connection it is pertinent to refer to a recommendation in the Interim Report, endorsed and emphasised in the Final Report, that a lighting authority should always be advised by an engineer competent to deal with street-lighting problems. In this way and with the issue of a British Standard Specification, which, as the Committee states explicitly, is needed to translate its recommendations into specification form, the public lighting of this country should be able to provide adequately for the convenience and safety of the ever-increasing volume of traffic using the roads at night.

The Domestic Hearth

By H. H. Berry, M.I.E.E.

Why the coal grate is still popular

Twenty-one years ago the author of this article produced his first electrical coal fire. It was from a coal fire that he gained the original inspiration during convalescence after a prolonged and serious illness. In 1957, when the idea celebrates its majority, it is noteworthy that the aggregate number of electric fires of this type put into service has exceeded one million.

ELECTRIC heating needs no introduction. Glamorous to some, a mere convenience to others, anathema to a few, it is at least known and recognised as an essential part of the equipment of the labour-saving home. Small wonder, therefore, that millions of electric fires have superseded other methods of heating during recent years. With this evidence to stimulate our enthusiasm, would it be correct to assume that the electric fire, *ipso facto*, has completely captured the imagination of the public? Has the hot wire element, as we know it, endeared itself beyond expulsion and finally laid low the coal fire?

To dispel any such illusion it is only necessary to survey, from an elevated position in any town, the compact rows of domestic chimneys and the tale-telling clouds of sulphurous smoke issuing from them. There is abundant proof that our formidable rival, the coal fire, is an unconscionably long time a-dying. After many years of decaying popularity its toll is still immense. Consider the treasures of life which civilisation and science have combined to build up, sacrificed by the domestic chimney: the smoke pall that descends at frequent intervals ironically to enshroud and obscure the very posters bearing the slogan—"A Fitter Britain."

Mr. H. H. Berry

How true remain the words of John Evelyn, who wrote in 1661—"That this glorious ancient city should wrap her stately head in clouds of smoake and sulphure, so full of stink and darkness, I deplore with just indignation. . . The immoderate use of, and indulgence to, sea-coale alone in the city of London, exposes it to one of the foulest inconveniences that can possibly befall so noble, and otherwise incomparable city . . . For when in all other places the aer is most serene and pure, it is here eclipsed with such a cloud of sulphure, as the sun itself, which gives day to all the world besides, is hardly able to penetrate and impart it here."

If we further traverse the primrose path of the coal fire we find a lamentable trail of destruction, extravagance and suffering left in its smoky wake. Its cost to the nation is incalculable; £60,000,000 is the astonishing sum devoted to the renovation of smoke-ravaged buildings in this country within the last twenty-five years. An investigation recently carried out in a large town revealed an annual soot fall of 1,031 tons per square mile, at a cost of £4 for each member of the population. Aviators, travellers, trees, decorations, books, clothes, and last but not least human lungs are common sufferers from the aftermath of winter evenings by the fireside.

A Deep-rooted Prejudice

A few years ago this extraordinary state of affairs was understandable. There existed only one known way of heating the home, inherited and taken for granted by generation after generation. The drudgery and inconvenience entailed were inevitable and accepted as such in days when domestic labour was available at a discount. To-day, heat is in no less degree essential to life, but we are no longer tied to the coal fire, except perhaps by a peculiar hankering for it. Indeed, it is absolutely incompatible with modern conditions. Yet, in spite of this, and in face of a wide range of scientific, labour-saving methods of solving the heating problem, it is said that 40,000,000 tons of coal are burnt in the domestic hearth year by year in Great Britain.

Such fantastic figures alone serve to reveal the uncanny, almost magnetic popularity of the coal fire. What is the inspiration? Scarcely can such popularity be accredited to some secret, health-giving properties, nor to any marvels performed in ventilation, or the saving of space, cost, labour or dirt. Where, or what, is the motive that preserves and keeps this soot-begetting anachronism in our midst? Who more qualified, more unrestrained, to answer this question than the eminent King's Physician who recently addressed delegates at the National Coal Convention. He said: "The open grate has a merit not shared by any other method of heating. It has a psychological effect"

> ***Coal fires possess psychological qualities which electricity must endeavour to reproduce if it is to supplant them***

Psychological effect! That is the essential for which this fabulous price is paid. Will the electric fire rival, surpass and eventually oust the appeal of that cheering blaze of flame and smoke with its tragic aftermath? The two-bar fire that stands apologetically in front of a fireplace opening is, in my opinion, only the thin end of the wedge.

A Hot Wire Not Enough

It has been said, perhaps with bias, that there is no need for electricity to be utilised in the production of effects. That concealment of function of this great product of science is nothing less than sacrilege. With this I do not agree. I believe that the universal acceptance of electric heating is dependent upon its power to create an electric hearth and home of such charm that it will steal the popularity of its predecessor. The mere hot wire is accepted for its efficiency and convenience, but what other appeal has it? Electricity is unique among sources of energy in its ability to make, if I may use the metaphor, a silk purse out of a sow's ear.

To this question of psychology I attribute the world-wide success of the electrical reproduction of the coal fire. It reproduces something of the atmosphere of the fireside. Its appearance, irrespective of its heating qualities, has an immense psychological appeal. It is not that the coal fire is a heritage so beautiful that it must be preserved by imitation. It is merely that in this adaptation of electric heat a sense of light and colour is produced to assist mental comfort, as warmth increases physical comfort.

And we are not limited to the reproduction of the coal fire in achieving this effect. There are beautiful and decorative ways of heating. I picture the diverse colour and spectrum effects of illumination. Here is something which in itself can create a sense of warmth, an electrical fireside of infinite charm and decorative value. In this electrical psychology we have something which neither coal nor gas can efficiently supply, and which can be enjoyed for a whole hour at the mere cost of striking a match.

The conversion of the builder and the house buyer who "must have the one coal fire" is the mission of those who design, make and sell electric heating equipment. To my mind, the realisation of such an ideal rests in our ability to give the public something equally as attractive as the coal fire. Something that will not rob them of the joys and happiness of the fireside, but will assimilate or improve upon it.

The future of electric heating seems assured when such realities as the servant problem and the questions of space and cleanliness at last drive home to the housewife the impracticability of the coal fire. In visualising the fine, clean, clear-skied cities of the future it is possible that when such a comparative Utopia is eventually reached, the electric fire will have played a vital part in bringing it about.

E.A.W. Activities

A conference of branch officers of the Electrical Association for Women was held at Digswell Park, Welwyn, Herts, recently. The subjects of talks and discussions included "Public Speaking—Speeches for Various Occasions," Discussion on the Work of Branch Officers," "The Constitution of the Association," and "The Correct Procedure in the Conduct of Meetings."

Miss Caroline Haslett, director of the E.A.W., is to speak at the inaugural meeting of the Thames Valley Branch to be held at the Zeeta Café, Kingston, to-day (Friday). The secretary of the new branch is Mrs. F. Byrne, 172, Elmbridge Avenue, Surbiton.

Cardiff Engineering Exhibition

New electrical plant for mines and metal working industries

EVERY year the Cardiff Engineering Exhibition, organised by the South Wales Institute of Engineers, emphasises with increasing force the growing use of electricity in mines, steelworks, and in the metal working industries for which South Wales is noted. The present exhibition, which may be the last held in the Greyfriars Hall—it is hoped that by next year Cardiff's new Exhibition Centre will be built—has a greater proportion of electrical plant than hitherto, including much new apparatus.

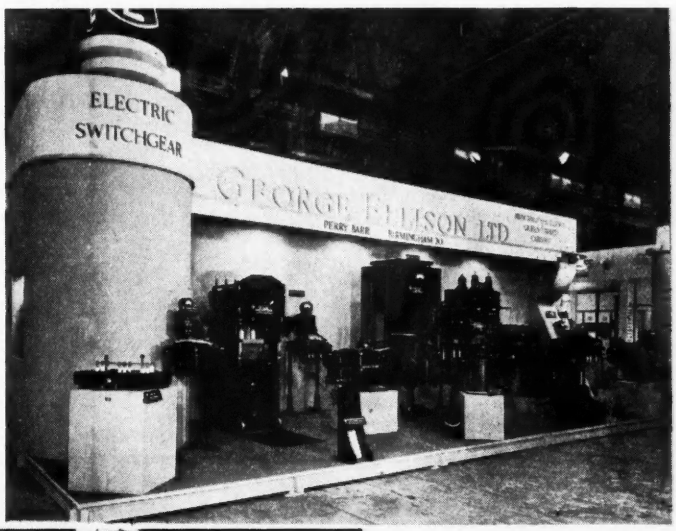
Of special interest on the stand of Crompton Parkinson, Ltd., is a 75-h.p. auto-synchronous motor which combines the performance of a slip-ring machine with the capacity to improve the overall power factor of an installation comprising mainly induction motors. One of these machines, a 1,000-h.p. model, is to be used in a South Wales cement works, and several motors from the range are already installed in the new British (Guest-Keen-Baldwins) Iron and Steel Co.'s steelworks at East Moors, Cardiff. A new 3-h.p. Crompton auto-start three-phase machine is claimed to have a high starting torque with low current consumption. When switched directly on the supply main the starting torque is approximately 2¾ times full load torque with 2¾ times full load current. Its "Marathon" type bearings do not require oiling for two years.

In the switchgear section is a metal clad compound oil-filled switch unit recently sent to Sweden to be tested. In this connection it may be mentioned that Crompton Parkinson are at the moment building their own testing station. A development of the "gallery" type of mining transformer is shown on flanged wheels for portability underground, this unit combining the transformer, high-voltage switchgear and low-voltage switchgear, usually mounted separately. An on-load tap changer is demonstrated with both the 33-kV tap changers visible on a cut-away exhibit. Mercury switches are incorporated to take the arc whilst tap changing takes place, thus eliminating pitting and burning of contacts. Demonstrations show how Crompton "Neophan" glassware reduces the excess of yellow rays in artificial lighting. Discharge lamps colour corrected by means of a coating of fluorescent material on the glass are on view.

A model of the electrical control of automatic winding equipment for mines is demonstrated by the Metropolitan-Vickers Electrical Co., Ltd. This company's recurrent surge analyser, in which a cathode-ray tube is used to show various wave forms and electrical phenomena, has been constructed to test electrical apparatus, especially transformers, under conditions approximating to those met with in service. Sub-station and metering equipment, lighting apparatus, and electric welding electrodes are also to be seen, and a special display is made of "Trafforoll" bakelised bearings.

Probably the most notable of the new switchgear shown by George Ellison, Ltd., is a 2,200-A circuit-breaker for use on circuits up to 660 V. It has drawout isolation, is oil filled and has a rupturing capacity of 32,000 kVA. Special features include an electrically welded fabricated bus-bar chamber, three cables per phase maximum, and the method of raising and lowering the oil tank by steel ropes. The model exhibited weighs two tons, and after the exhibition is to be installed at the Gramophone Co.'s factory. A new 11,000-V oil-filled truck switchgear rated at 300 A has a breaking capacity of 150,000 kVA and embodies the drawout truck with the drop-down method of isolation. An extensive system of interlocks is incorporated. Other exhibits include a flameproof auto-transformer starter fitted with a useful detachable cable sealing pot, making it possible to clamp and seal the cable at the pithead. A feature of the company's flameproof lighting fittings, which are suitable for use in methane, acetone, and petroleum vapours, is the convenient method of cable fixing. "Tufnol," an insulating material only half the weight of aluminium, is demonstrated by Ellison Insulations, Ltd.

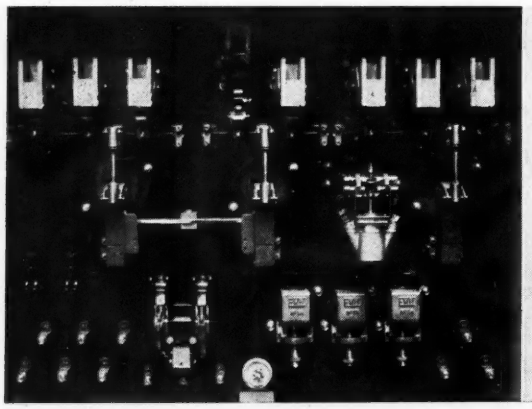
Examples of under-water power cable can be seen on the combined stand of Siemens Bros. & Co., Ltd., and Siemens Electric Lamps & Supplies, Ltd., while prominence is given to narrow-type feeder pillars. A wide range of mine and industrial signal-

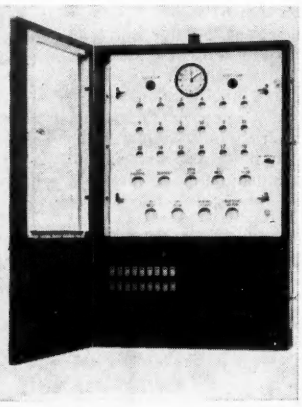


Three well-arranged exhibits at the Cardiff Engineering Exhibition. From top to bottom the stand of George Ellison, Ltd.; the combined display of Siemens Bros. & Co., Ltd., and Siemens Electric Lamps & Supplies, Ltd.; and the Crompton Parkinson exhibit

ling gear is demonstrated, a new exhibit being an automatic recorder which records all signals and the stopping and starting of the winder or hoist. Thus the sequence of operations may be traced and cases of anticipation of signals discovered. In addition, there is a complete range of telephone equipment and staff-locating equipment, together with lighting appliances. As a part of a demonstration of "Sieray" electric discharge lamps several are fitted both inside and outside the exhibition hall to give colour corrected illumination.

A new item among Gent & Co.'s usual wide range of bell systems, telephone equipment, electric clocks, and fire-alarm signalling gear is a loud ringing bell, available for a.c. or d.c. or for battery operation. A high-voltage bell push shown is capable of handling 1 A at 500 V, and is enclosed in a watertight case with a cover and gasket. In a fire alarm equipment recently supplied for the new Earls Court exhibition building a ten-line cable has achieved the same results as would be given by some eighty wires in a normal installation. Similar systems have recently been fitted in a large warehouse for the Southern Railway and in the Blackpool Tower.





E.M.B. "50 ASD" automatic star-delta starter and a Gent fire alarm indicator board of the type used at Earls Court

Among a comprehensive range of control gear, the E.M.B. Co., Ltd., has a new automatic star-delta starter fitted with time lag change-over relay for remote control of motors up to 40 h.p. at 440 V. All the E.M.B. exhibits are fitted with contactors, which in many instances are built as single units which can easily be withdrawn from their casings.

"Lindewelding," a new method of jointing pipe lines by means of oxy-acetylene welding, is demonstrated by the British Oxygen Co., Ltd., which, among various types of welding and cutting equipment, has an electrically operated profile cutting machine. Electrically operated high-pressure lubrication equipment and air compressors may be seen on the Tecalemit stand. Much attention is being attracted by an exhibit of the Demag A.G., Duisberg, which displays models of mines, travelling grabs, conveyors, and winding engines. The pit-head gear is of all-welded construction.

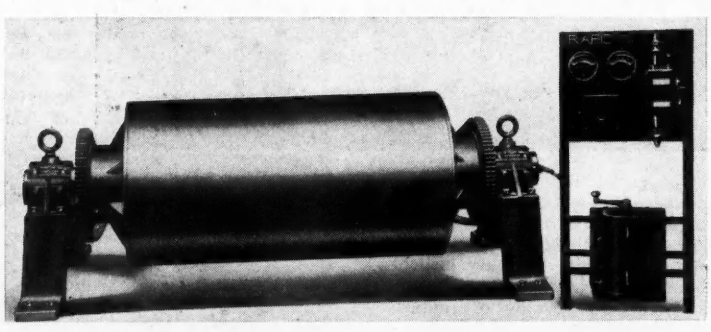
Other exhibits include examples of armature coils and electrical work by British Electrical Repairs, Ltd.; electrically operated wood-working machinery by the Dominion Machinery Co., Ltd.; a talking-film demonstration by the Department of Scientific and Industrial Research; a.c. motor-testing wattmeters and electric clocks by the Farrer Engineering Co., Ltd.; electrical equipment by A. Reyrolle & Co., Ltd., and control and testing gear by Evershed & Vignoles, Ltd., on the stand of Sidney B. Haslam; and scale models of the layout of the Treforest Trading Estate. The exhibition closes to-morrow (Saturday).

A Large Magnetic Separator

SUCH machines as crushers and grinders are liable to be damaged by the ingress of "tramp" iron. This risk can be avoided by the use of magnetic separators, of the self-cleaning type for continuous operation, and preferably of drum design. Since the material to be treated can be fed into direct contact it is more thoroughly searched than if a belt were interposed as in the case of a magnetic pulley, which needs less headroom, but is of greater weight and requires more power to drive it.

What is claimed to be one of the largest magnetic drums so far made has been supplied by the Rapid Magnetting Machine Co., Ltd., Birmingham, for protecting a shredder dealing with large quantities of bagasse (sugar cane) which is brought forward by means of a slot conveyor measuring 6 ft. wide, the max. depth of material for treatment being 10 in.

Modifications on site have enabled this magnetic separator to be placed below the head pulley of the conveyor so that the material passes forward over it before entering the shredder. The extracted "tramp" iron is discharged entirely automatically, there being no cut-out devices to interfere with reliability, and a liberal factor of safety has been allowed for continuous operation, as this drum will normally run for several months at a time during the season.



Drum-type magnetic separator supplied by the Rapid Magnetting Machine Co. for protecting a shredder dealing with large quantities of bagasse

The exceptional depth of feed and width of the drum have necessitated a special magnet design. The dimensions of the drum are 36 in. diameter by 7½ in. wide working face. The centres of the bearings are 8 ft. 10 in. apart and the overall length is nearly 11 ft. The weight of the drum ready for shipment is 7½ tons, the switchboard and totally enclosed motor-generator set being separate items, needed for d.c. operation. The maximum power consumption is 4¼ kW.

The design of a magnetic pulley of large size is comparatively simple. In the case of a drum, however, the clearance between the rotating cover of the magnet poles inside must be cut down to ensure the minimum reluctance for the magnetic path. This produces difficulties, inasmuch as the permissible bending of the magnet unit inside the shell has to be reduced to the absolute minimum. In this equipment the tolerance allowed for bending of the shaft was half a degree per 12 in. length, which is an extremely small amount.

The major problem in design was to produce a magnet system having a sufficiently high bending moment to prevent any possibility of a sag in the centre being sufficient to cause the magnet poles to foul the cover. The strength of the cover itself is so great that no allowance has been made for bending. It was impossible to put a large shaft throughout the job because the magnetic permeability of this part would have been much inferior to the rest of the magnet system and could not be tolerated. Therefore all the parts carrying the magnetic flux are of high permeability steel. Due to the very limited space available inside the drum for the mechanical portion, considerable use has been made of high tensile bolts and nuts. The bearings are of the double row self-aligning roller type.

The drum is driven at each end from a countershaft by means of 1-in. pitch "Triplex" chains from the head pulley of the slat conveyor at 4.8 r.p.m. The switchboard comprises a star-delta starter for the motor-generator set, ammeter, voltmeter and shunt regulator for the d.c. side, and a potentiometer controller and resistance for dealing with the magnet current. The first operation of the controller is to connect the potentiometer resistance across the line; further movements of the controller place one end of the magnet winding to different tappings on the resistance. In the last stage the magnet is connected direct across the line with the potentiometer resistance cut out. To switch off, the procedure is reversed; at no position is the circuit open.

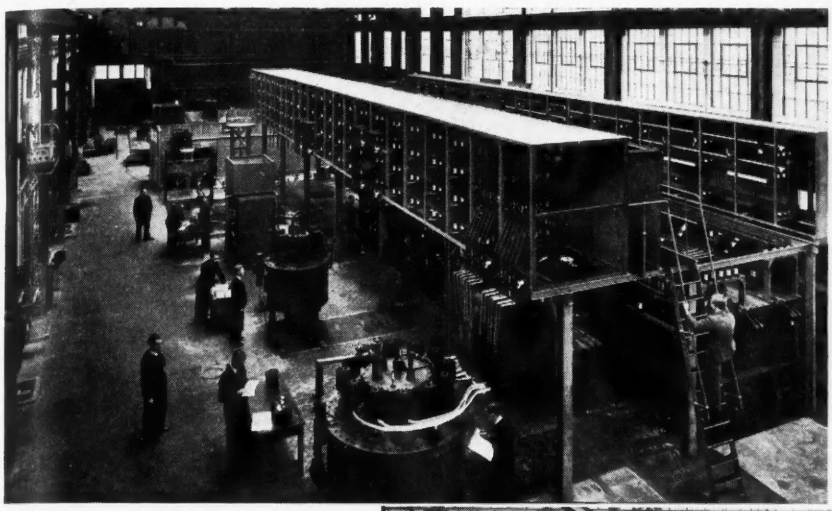
Activities at Witton

Recent extensions of the G.E.C. Works

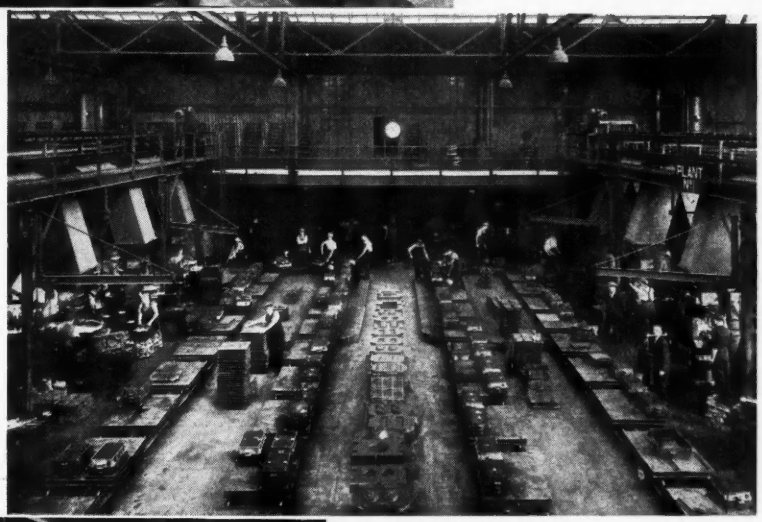
New rectifier works; enlarged capacity for battery production; and a mechanised foundry

THE Witton Works, Birmingham, of the General Electric Co., Ltd., is constantly being extended to meet increased demands and new developments and to-day that important group of factories covers an area of about 70 acres (on a 200-acre site) and gives employment to nearly 10,000 people.

Last week we were invited to inspect some of the more recent achievements, particularly the new mercury-arc rectifier works, the battery works, the moulded insulation department and the new mechanised foundry. Another important development, the high-power test laboratory, was described in our issue of March 13th, 1936.



The rectifier works is claimed to be the first self-contained works in the world for the production of steelclad mercury-arc rectifiers. It covers an area of 20,000 sq. ft. with ample room for expansion and comprises a receiving stores, machine tool and assembly bays, and comprehensive testing plant, despatch department and a works sub-station. In addition there are shops for mercury filling, leakage testing, welding, paint-spraying, etc. Two 15-ton handling cranes have been installed.



Above: Test bay of the new mercury-arc rectifier works. Right: The mechanised foundry. Below: The coil-winding and insulating shop

The most noteworthy product of the works is the company's pumpless air-cooled rectifier which depends for the maintenance of vacuum upon a specially-designed vitreous anode seal samples of which were inspected. The seals are made in a separate shop adjoining the assembly bay.

The rectifiers are partly assembled on special jigs and are then taken to a dustproof mercury filling room in which the arrangements are such as to ensure a high degree of safety for the workmen. The anodes, which are made in another dustproof shop, are brought in and fitted.

Very comprehensive testing arrangements exist to ensure sufficient capacity to enable the largest units to be tested at loads well in excess of those they are designed for and to enable development work to proceed without interfering with routine production testing. The layout of the busbars is a marvel of compactness and convenient arrangement. The testing plant includes two large motor-generator sets, which can be employed singly or together to give a continuous output of 6,000 kW at 900, 1,800 or 3,600 V, with a variable-speed driving motor; and three rectifier transformers with a total capacity of 16,500 kVA and special connections. When a rectifier is under test the synchronous machines of the m.g. sets operate as alternators, energising the primary windings of the transformer which feeds the rectifier. The d.c. output of the latter is fed back to the d.c. machines thus circulating the bulk of the power, while the driving motor compensates for the losses of the system.

As in the other component parts of the Witton works, ample space characterises the battery department which was practically doubled two or three years ago. There the processes are planned to sustain a flow through the factory from the entry and mixing of the raw materials to the labelling and packing. The principal products are radio and torch batteries, but in addition Leclanché cells are made for the G.P.O. and other Government departments and special batteries for colliery applications and telephones.

The foundry at Witton covers about 2½ acres of land and is capable of producing castings weighing anything up to 25 tons. Recently

a new mechanised plant was added to the foundry for the production of pieces up to 40 lb., such as switch cases, fractional h.p. motor shells and motor bearing brackets. The moulds are rapidly produced in automatic machines and transferred to a travelling band. Fettling and dressing are conveniently arranged near the "knock-out" stations and a totally-enclosed sand blast apparatus fed by a steel slab conveyor completes the installation. The whole of the equipment is housed in a tall and spacious building.

An extremely wide range of products is turned out by the moulded insulation works which was recently extended by a 40,000 sq. ft. addition. A display arranged in the main shop included a bakelite fire, telephones, thermos jugs, clock-cases, as well as such components as lampholders, plugs, switches, etc. The department employs about a thousand people. The top half of the new two-storey building comprises a metal insert stores, assembly department and a canteen capable of seating 400 people.

Above: The finishing shop of the moulded insulation works. Right: Final assembly and packing of batteries

A number of other works have been considerably extended in the last year or two. For instance, the main switchgear works has been lengthened and a complete new storey built over part of the works for the production of standard starters and controllers on a quantity basis. A new shop for generator and motor coils has been erected over part of the main engineering works and increased space provided for the manufacture of small motor-driven appliances —vacuum cleaners, polishers, hair dryers, fans, mixers, etc.

Additions have also been made to the development laboratory and a new building erected for the storage of jigs. The central stores has had to be considerably extended; this department is of astounding proportions and must present nearly as many problems as the manufacturing side.

Rural Electrification Finance

A STATISTICAL survey of rural electrification, by Mr. G. V. Harrap, of the Hull electricity undertaking, has been published in the current issue of the I.E.E. *Journal*.

After a review of the technical details and commercial progress of four schemes, namely, Bedford, Norwich, Dumfries and Kirkcudbright, the general financial results are divided into their components and referred to various bases. The economics of farm supplies is elucidated and then the analysis is developed to ascertain the return on capital, and the capital expenditure per consumer. An attempt to determine the economic limit of rural electrification is followed by an examination of the various items of expenditure and revenue. Following other statistical data, the conclusion is reached that technical proficiency is secondary to economic and financial control.

The author points out that as load factors have increased the relative cost of energy has decreased. Up to the present, however, administration has naturally shown the greatest decrease; the total maintenance cost has increased, but the charge per kWh has remained fairly steady. In some instances the relative cost of taxation has progressively increased. On the revenue side the proportion obtained from flat rates for lighting and cooking has decreased, and there has been a progressive increase in the relative revenue from two-part tariffs.

The value of developing the normal rural loads of an industrial nature is shown by the fact that revenue from this source has increased in importance. The fact that the cost of distributing the energy is much greater than the cost of the energy purchased is clearly shown. To ensure a cheaper supply the proportionate cost of energy must be increased not so much by economies in distribution equipment as by the greater use of that equipment.

Of the four schemes which have been considered the Bedford scheme is at present in the worst position, says the author, since a considerable deficit is still resulting from its operation, and yet the economic limit of development is approaching. Additional expansion can only be undertaken at relatively greater cost, and hence the only outlets for improvement are an increased usage by the consumers (preferably the non-industrial classes) and a progressive reduction in capital charges. The percentage annual return appears to have reached a steady value, and may fall in future years. The kWh sold per consumer are already comparable with the corresponding figures for the more successful schemes, but the financial position is handicapped by the low tariffs necessary to obtain industrial power.

The Norwich scheme appears to be on the way to profitable operation. In view of the considerable development already completed, and the deficit still outstanding, the ultimate result can only be a small profit. The Dumfries scheme should shortly show a profit, but the increase in percentage annual return is becoming progressively less.

The Kirkcudbright scheme is similar to that at Dumfries. The very low capital expenditure per consumer attained may be partly due to the terms under which its predecessors were acquired. It is noteworthy that both this and the previous scheme have been largely dependent upon the construction of the C.E.B. system in S.W. Scotland.

The increase in kWh per mile of mains illustrates the preponderance of the industrial load at Bedford. The results on the other schemes accord more closely with those attained on rural undertakings elsewhere. Revenue and consumers per mile of mains reflect the initial increase in mains length followed by increased connection of consumers. They also illustrate that the Norwich scheme could stand further cultivation of the area load.

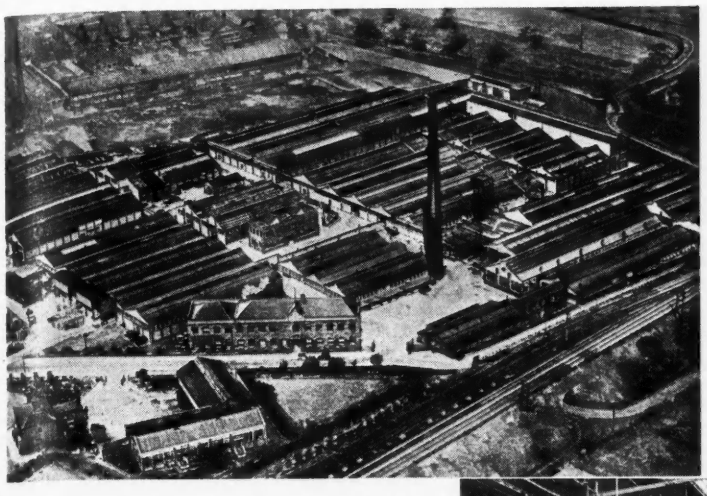
In appraising the merits of these schemes it should be noted that the cost of energy to the last two was over ½d. per kWh, whereas for the first two it was under 0.4d. In the matter of working costs, comparison should be made with those at Chester (0.92d.), Aylesbury (0.86d.), and the West Midlands J.E.A. (0.85d.). In Dumfries and Kirkcudbright the density of population is less than one-third of the average for rural areas in Great Britain, and the achievements of these undertakings are therefore all the more creditable.

Much of the work involved in obtaining farm and small industrial loads demands more mechanical than electrical knowledge. Appreciation of financial and economic matters is essential, and, as in power sales generally, the undertaking must offer competitive terms.

The Production of Batteries

Visit to the Exide Works

THE secondary battery is a very necessary electrical auxiliary and with the increasing availability of electricity it is assuming a more and more important rôle. It finds application in many diverse spheres—railways, automobiles, aircraft and other transport, cinemas, submarines, radio communication and emergency lighting, to mention a few.



The Chloride Electrical Storage Co., Ltd., claims that its Clifton Junction (Manchester) works is the largest in the British Empire.

A visit to these works last week gave us an opportunity of inspecting not only the most advanced methods of production of batteries of diverse types, but to become acquainted with the extra-

Above: Aerial view of the Clifton Junction works of the Chloride Electrical Storage Co., Ltd. Right: The moulding shop

ordinarily heavy service demands which are made upon them.

For lighting purposes alone more than 500,000 cells are in use to-day on the British railways and a considerable part of this business is handled by the Chloride Co. In addition, accumulators have been developed successfully for electric cooking on dining cars and on buffet and pantry cars. Obviously a type of cell is required capable of withstanding the extremely rigid conditions in service—the rate of charge and discharge being high, particularly in the case of a cooking battery consisting of 90 cells.

Aircraft batteries are made in two 12-V groups. It is essential that this type of battery should be truly unspillable in order that it may be placed in any position during flight without loss of electrolyte. The thickness of the plates in one of these groups is only $\frac{1}{75}$ in., requiring (as might be imagined) an exceptionally high standard of casting and pasting in order to obtain the required life and capacity balance.

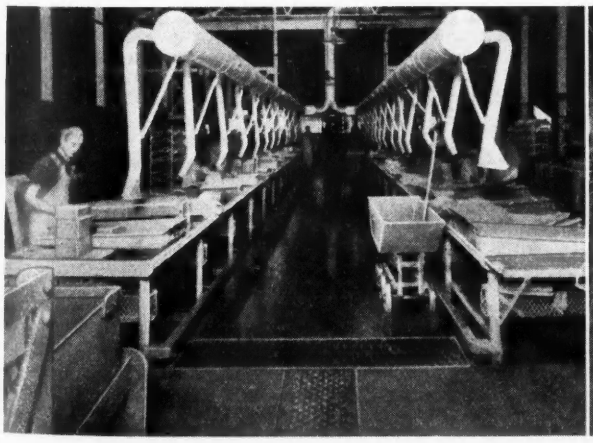
An interesting feature of the development of storage batteries for marine work has been the reduction in their weight and volume. Progress in construction can be measured by the fact that the latest types of batteries weigh only 60 per cent. and occupy only 55 per cent. of the volume of the earlier batteries. The variety of equipment in ships is very great and is all liable to require supply from the battery at some time or other, such as for lighting, radiators, cooking ranges and refrigeration. Hence it is possible to secure the continuance of electric power without keeping the engine room staff on duty day and night.

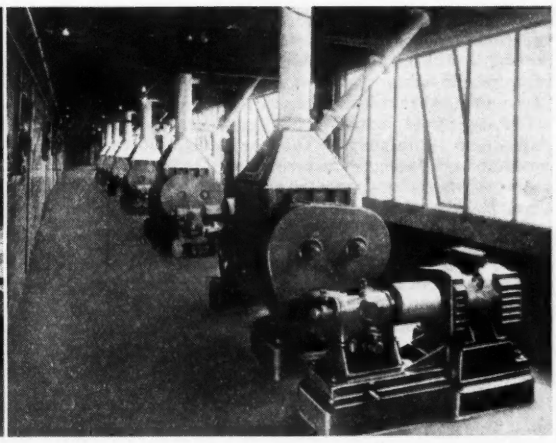
Four gradings of batteries are manufactured and each has its own special characteristics:—(a) Chloride-Planté and Chloride rosette, (b) special Planté portable, (c) "Exide," (d) "Exide-Ironclad."

Elaborate precautions are taken to protect the workers. Their health and welfare is under the supervision of a whole-time medical officer and all handling of oxide and plates is carried out under an exhaust system, the workers having a glass screen between their faces and their work, any dust that is created being carried away by suction from the worker. Where it is not practicable for work to be done under an exhaust, specially designed respirators are worn.

In certain processes a complete change of clothing is provided for the workers, who take a bath at the end of each shift before dressing in their own clothes. A further aid to health is the works' dental clinic.

Leave of absence on full pay is granted to all employés who qualify in accordance with certain rules and a holiday-saving





Left: The pasting department showing the elaborate extraction system for the protection of workers. Right: General view of dry mixers

Meetings and Discussions

Some of the latest developments in measuring instrument construction and design were reviewed by Mr. H. Cobden Turner in his address as Chairman of the Meter and Instrument Section of the I.E.E. Mr. J. L. Eve also made a useful survey in his address to the Transmission Section, dealing chiefly with the various types of pole now available. Monsieur Bachellery's paper on French railway electrification called forth some criticism from sceptics and he showed that he was not shaken in his conviction that electrification paid. At an E.P.E.A. meeting last week Mr. R. M. Charley read an instructive paper on transformer practice.

Modern Measuring Methods

THE inaugural address in London on November 5th of Mr. H. Cobden Turner (Salford Electrical Instruments, Ltd.) as chairman of the Meter and Instrument Section of the Institution of Electrical Engineers commenced with an historical survey, mainly illustrated with the aid of lantern slides. It was explained how combination with rectifiers had enabled moving-coil instruments to be made in compact portable sizes for small a.c. measurements.

Mr. Turner contended that only electronic rectifiers, such as the semi-conducting selenium and copper oxide types, had survived the test of time and could be relied on for accuracy and constancy. Temperature errors could be compensated for and special rectifiers of small capacity extended the range of such instruments into the high-frequency field. The current range could be increased appreciably with the aid of a transformer, the step-down ratio of which could be arranged to limit the secondary current to a value which reduced the skin effect at high frequencies.

The transformer core was made of very thin nickel alloy stampings or, for frequencies above 5 megacycles, of magnetic dust. For the measurement of the aerial current of short wave radio transmitters the aerial could be threaded through the centre of a toroidal transformer. The use of a step-down transformer had also shown the way to the use of thermocouple instruments for larger currents at radio frequencies, by the same process of reducing the skin effect when the heater wire was made larger. Thus the thermocouple instrument would continue to find important application for laboratory use, because of its high accuracy, while the rectifier instrument might replace it for portable and commercial work where robustness, overload capacity and good scale shape were demanded.

Still smaller power consumption was possible when the rectifier was of the thermionic type. The advantages claimed were that a wide frequency range was possible with negligible power consumption and extremely small capacitance. This group of instruments had recently emerged from the laboratory to the commercial field, and was now made in various portable types in self-contained cases. Whereas the original designs needed an external battery, many valve voltmeters were operated from a.c. mains and contained their own stabilising equipment. Special thermionic valves were made for these instruments in which the grid and its leads were isolated from the other electrodes to minimise self-capacitance.

Mr. Turner remarked upon the penetration of electrical measuring devices into industries quite unconnected with electrical engineering. The demand for them was growing, and while the tendency to make instruments direct reading had sometimes been criticised because of possible errors in calibration it was of incalculable value to the user. Another fairly recent achievement was the provision of special scale shapes other than those inherent in the design.

The use of h.f. currents for sundry special measurements was still in its infancy. They could be used for measuring insulator and dielectric materials with the same facility that d.c. could be used to measure conducting materials. An oscillator driven from a.c. mains could be built into a very small space, the remainder of the essential parts consisting of a bridge, a resonant circuit and a detector of the valve voltmeter or metal rectifier type. Of these circuits, the resonant type with built-in voltmeter had much to recommend it. Typical examples were the "L-meter" for the direct measurement of inductance and the "C-meter" for the direct measurement of capacitance.

Measurement of the losses or power factor of a capacitance was important for materials used for the construction of condensers or those which were to be placed under electrostatic stress. But there was also a field outide the electrical industry for such equipment for the measurement of the losses of such materials as oils, liquids, fats, mouldings and synthetic products, which formed a very useful guide to their purity. It was considered that here was a new field for the use of electrical measuring equipment.

The speaker then proceeded to describe various types of thermocouple temperature indicators, and photocells as employed in illumination meters, photographers' exposure meters and for measuring the colour and gloss of substances. He also mentioned the measurement of sound; angular velocity by a small dynamo revolving at a speed proportionate to that of the moving body; and control of the thickness of metal foil and sheet during rolling by an electric micrometer depending on the screening effect of metal at high frequencies. Change of weight with time could be measured automatically by a chemical balance fitted with electrical contacts associated with a recorder.

Other instruments were described for testing the fatigue of metals, float controlled depth recording, determining impurities in mine atmospheres, estimating acidity and alkalinity, measuring the flow and viscosity of liquids and the brightness of road surfaces, while the seismograph was described as an electrical device, showing that instrument engineers had a limitless field of progress and new applications before them.

The Production of Batteries

(Concluded from previous page)

scheme is in operation. A non-contributory pension scheme was instituted in 1925 and the company has contributed £10,000 annually to the fund. The accumulated funds now in the hands of trustees amount to approximately £200,000. Since 1918 there has been a works committee for the purpose of promoting good relationship between the management and the employés.

A trainees' scheme was put into operation about ten years ago. The scheme comprises a course of two years' training in the various departments of the works and offices, and it is designed to qualify those completing the course for the semi-technical and commercial vacancies in the organisation.

Overhead Line Trends

THE more prominent stages in overhead line development were reviewed by Mr. J. L. Eve in his inaugural address as chairman of the Transmission Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on November 17th.

Lack of progress between 1904 and 1919 had been wrongly attributed to the onerous regulations laid down by the Board of Trade, but it was, in fact, chiefly due to the great difficulty of obtaining the necessary wayleaves. That situation was not eased until the passing of the Electricity Act of 1919, which provided for the compulsory acquisition of wayleaves. Examples of the work carried out during that and subsequent periods were illustrated.

Mr. Eve regretted that results of tests of a comprehensive nature on earth type pole foundations were not available to replace the rule of thumb method of determining the necessity or otherwise of foundation blocks.

Progressive engineers were soon in the field with various designs of steel structures. Tubular steel poles offered many advantages over wooden poles. Their cost, and the inherent difficulty of attaching the insulators were the chief reasons for their lack of general favour in this country. Both wooden and steel poles were difficult to transport and various forms of steel construction had been proposed in an endeavour to find an economic alternative to the wood pole which was now so largely used.

The "P.B." pole, consisting of two special section channels braced together, should perhaps be considered as an offshoot of the lattice tower, but nevertheless it had stood the test of time as a substitute for the wood pole. The Bates pole, formed by slitting and expanding a rolled steel joist, although used much on the other side of the Atlantic, had hardly been used in this country at all. Among more recent entries into the field were the "Fista" pole, constructed by welding two channels and two plates into a box section, and the "Adastra" pole, a sectional oval steel tube construction, developed in Germany, which was supplied in sections claimed to decrease transport and erection difficulties materially.

Reinforced concrete poles had achieved quite a measure of success in some cases. Insufficient care in manufacture and poor quality material were grave sources of danger to the precast type of structure, and poles could be seen in a very bad state of preservation. In some cases not only had the concrete cracked, but had flaked away from the reinforcing rods, which

Measuring Instrument Design
Transmission Line Poles
French Electric Railways

had buckled, and when left bare corrosion set in with serious results. To-day, however, modern methods of manufacture had overcome such troubles and excellent poles could be obtained that were also very pleasing to the eye.

The spun pole was of a very dense character with an exceedingly smooth surface. It was rather surprising that only one high-voltage line had been erected on this type of pole, although for quite a number of tramway and lighting schemes it had been adopted in the smaller sizes.

The Central Electricity Board's decision to subject all lattice steel towers designed for it to mechanical test showed the necessity for very careful consideration of such details as cross-arms and bracing connections. Mr. Eve regretted that the results of these tests could not be made available for the general good of the industry.

Many thousands of miles of composite conductor had been erected and the reinforcing of copper conductors with a steel core had not been neglected; both copperweld and steel cored copper strand had been used extensively. The holding of these reinforced conductors at end strain positions had caused a great deal of controversy. The compression clamp had only been used on one complete line, and for certain special work, which was surprising in view of the advantages that it had to offer.

One of the more recent developments was the use of the post type to replace both pin and suspension insulators. In one district certain lines running along the sea-coast were originally fitted with four-unit suspension sets and supply was continually being interrupted by flash-overs owing to salt deposits. After changing over to post type insulators the trouble was overcome.

The design of overhead lines had during the last fifteen years passed from guesswork to exactitude. The only difficulty the designer had to-day was in estimating the loadings that structures, conductors and insulators would have to withstand, and making suitable allowance for the especial conditions likely to occur in any particular district. Often far too little consideration was given to this aspect, many engineers being content to design strictly to the Regulations, regardless of local conditions. Some conditions of loading were so rare that to guard against them would be uneconomic.

One of the most common causes of trouble was birds perching on the conductors and touching earthed metal, but this never occurred on lines working at extra-high voltages. Lightning was causing many engineers seriously to consider the provision of special forms of protection. Over moorlands and in the mountains snow and ice loading sometimes occurred to a much greater extent than allowed for in the Commissioners' loadings. Ice coatings up to 6 in. in diameter had actually been observed on more than one occasion in recent years and, when coupled with high winds, had proved disastrous.

Frequency Control

IN his inaugural paper as chairman of the London Students' Section of the INSTITUTION OF ELECTRICAL ENGINEERS on November 19th, Mr. N. C. Rolfe attempted to show how standard instruments of great accuracy had been developed for radio-frequency measurement and control. Their principles of operation and the various methods of making precision measurements now in commercial use were outlined.

Mr. N. C. Rolfe

A continuously-variable wavemeter in conjunction with a fixed-frequency oscillator could be made astoundingly stable, and the author showed why a standard having a h.f. fundamental, such as a crystal, was superior to a l.f. fork-controlled standard when the precision measurement of high frequencies was concerned. A multivibrator or harmonic generator enabled a complete frequency spectrum, having intervals of about 10 kilocycles, to be produced, and lent itself to ease of stabilisation and control by virtue of its inherent electrical properties, particularly with reference to the nature of its complex feed-back arrangements.

The author confined his remarks to crystal-controlled standards. Atmospheric variations affected the performance considerably, and the various steps taken to ensure adequate compensation for these effects were discussed. Special methods of temperature control were required. Two methods of control were described, one depending upon an electrical bridge method in which mechanical relays were dispensed with, the other being a purely mechanical method of control. It was shown that precautions had to be made in order to reduce to the absolute minimum any form of unnecessary coupling which was likely to cause undesirable instability of the oscillator. With conditions adjusted carefully such accuracy and stability as 5 parts in 10^8 and 2 parts in 10^7, respectively, were representative values.

The range of frequencies likely to be covered by direct methods of measurement on a typical meter was of the order of 100 kilocycles to 20 megacycles. Individual meters, however, varied considerably from this range, but in every case frequencies outside the range could be measured by using harmonic methods to the same degree of accuracy.

Two methods were mentioned of enabling the fundamental of the master oscillator to be compared directly, and without a great deal of trouble, against the absolute unit of frequency —the solar second. One was a visual method which gave an idea of the long-period stability of the meter, and the other was a photographic or mechanical-recorder method which enabled the instantaneous value of the accuracy to be ascertained.

It was probable that high-precision standardising equipment would have to be revised to give even higher accuracy and stability for television and ultra-short-wave requirements.

Electric Railway Economics

AT a joint meeting in London on November 18th of the INSTITUTION OF ELECTRICAL ENGINEERS with the British Section of the French Society of Civil Engineers Monsieur A. Bachellery read his paper (to which reference was made last week) on railway electrification in France, and illustrated it with a large number of lantern slides. The discussion was opened by Mr. W. T. Halcrow (President, British Section, French Society of Civil Engineers), who said that having travelled on those railways, before and after electrification, he could speak of the great improvement that had been brought about.

Mr. Roger T. Smith said that whereas the great consideration on the Continent was the saving of coal, in this country, where coal was plentiful, the effort had been to improve the efficiency of the steam locomotive. The carriage of coal in this country by the railways was still 36 per cent. of the total freight traffic on the railways and represented one-fifth of their total revenue, and therefore the reduction of this traffic, if coal were burned in power stations instead of in steam-locomotive boilers, had to be taken into account from the points of view of loss of revenue and also of interfering with the business of the railways' best customer. Thus the economic reasons for and against electrification of main-line railways were very different in this country from those in France, Switzerland or Italy, where the saving of coal was all-important. On the other hand, on many stretches of main line here the ton-mile density was above the figure where it paid to electrify; such sections were being carefully considered by the railways and the conversion of some of them was beginning to be carried out.

Mr. C. E. Fairburn said he had been closely associated with the early work connected with the Midi electrification, and a certain amount of the plant came from this country. The fact that the French authorities decided to standardise one system without multiples or sub-multiples had done a great deal to speed up the electrification of those railways, and a second important step was the standardisation of the type of control. In those circumstances the manufacturers were able to devote all their attention to one set of conditions. Although the Weir Report was out of date, it stated that the cost of electricity would be slightly less than that of locomotive coal, but on the L.N.E.R. and the L.M.S. it was 12 and 9 per cent. more respectively. Even with the extra availability of electric locomotives, their cost was more than that of steam locomotives, and that showed up in the economics.

Mr. F. Lydall agreed with Mr. Fairburn that it would be interesting to have more information with regard to some of the accountancy matters. The cost of coal and water at present prices was something like 25 per cent. of the total and, of the remainder, the cost of train wages, including drivers, firemen and guards, was about 40 per cent. If one regarded electrification as a process whereby electric power was delivered to vehicles—locomotives or motor coaches—instead of coal it must be admitted that the cost of electric power delivered was almost certain to be substantially higher than the cost of coal and water. But it was possible considerably to reduce the other items, of which wages were the major item. There would be economic advantages in making greater use of multiple-unit trains instead of locomotives on local lines. The facility which electrification offered for one-man working, especially on goods trains, went a long way to justify it.

Monsieur Bachellery, replying, said that the operating expenses included the cost of energy after transformation, so that it covered the cost of capital on the power station, transmission lines and transformer stations. The conversion of the railways had been going on for fifteen years, and during that period electric locomotives had been ordered progressively to replace the steam locomotives as they went out of service. Therefore, it would not be fair to charge the electrification work with the cost of electric locomotives as, had they not been purchased, it would have been necessary to have new steam engines. That was the reason the comparison had been made in the way it had.

The gradients need not be regarded as an important item in the cost of operation; the main consideration was that many lines ran through tunnels and the atmosphere with steam working was "awful." Nevertheless, there was also a saving in coal, and greater facility in working. As to the higher cost of the electric locomotive, there were only about half the number of electric locomotives, and they remained in service for longer periods than steam locomotives. The French regulations did not permit of one-man operation, except on certain agricultural lines, but the difficulty was got over by the guard helping the driver when necessary. The fireman was dispensed with.

In reply to questions put by Messrs. H. C. Harris and T. S. Pick, the author said that the pull-over on curves was done away with by allowing the catenary wires to take a slant and reducing the length of spans for this purpose on sharp curves. The 12-anode type of mercury rectifier had been replaced by the six-anode type because this was much simpler and cheaper. No trouble had been experienced with the polarised anode grids. The experimental three-armature locomotive motor was used with four driving axles. There was a motor over each pair of driving axles, and one of the three armatures worked on one axle with gearing and the other worked on the other axle, whilst the intermediate armature worked on both axles, through intermediate gearing. This arrangement worked satisfactorily and gave a convenient method of speed regulation.

Modern Transformer Practice

AT a meeting of the London Technical Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION at Westminster on November 16th "Some Notes on Modern Transformer Practice" were presented by Mr. R. M. Charley (English Electric Co., Ltd.), who described several important features entering into the design of large transformers which presented almost greater mechanical difficulties than electrical. About 17½ million kVA of transformers with on-load tap-changing equipment, he said, had been built in this country; of that total about 10½ million kVA for service at 132 kV and lower voltages had been purchased by the Central Electricity Board. There was no demand in this country yet for larger units than those at present in service, or for transmission above 132 kV, but he claimed that when such demands arose English designers would be ready and eager to meet the requirements.

A new and very effective means of cooling a large core, using ducts stepped across the core, was described. The coefficient of heat transfer across the laminations was at least twenty times worse than it was along the plane of the laminations. Consequently, practically all the heat developed was conducted along the laminations and dissipated into the oil from the edges. When it was necessary to use cooling ducts in order to avoid excessive internal temperature it was desirable to position them at right angles to the laminations. Oil ducts could be placed in the plane of the laminations very simply, but on account of their relative ineffectiveness there must be a number of them, which was wasteful of space. Although more difficult to construct, the placing of ducts at right angles to the laminations affected the space factor to a negligible degree.

The author then described the effect of tappings in relation to mechanical forces in the windings, which was of great importance in large units, particularly because of the very wide voltage range required, 20 per cent. being almost standard and 30 per cent. or even more being sometimes required. The mechanical forces could be reduced by locating the tappings in the middle of the top and bottom halves of the column. Gaps left in the l.v. winding immediately opposite the tapping sections of the h.v. winding had the advantage not only of reducing mechanical forces, but also of producing reasonably constant impedance over the tapping range, and eliminating excessive eddy-current losses in the windings in the neighbourhood of the tapping sections.

After referring briefly to noise, pointing out that the flux density should be reduced to, say, 12,000 lines per sq. cm., and that great care should be taken in the mechanical design and manufacture of the transformer, the author gave some examples of the difference in cost for various methods of cooling. He pointed out that in spite of the extra cost, which at 40,000 kVA, for natural cooling, was about 14 per cent. greater than for forced oil circulation with air-blast cooling, natural cooling could very well be justified in many cases, particularly for large sub-stations where water supply was not available and would be very expensive.

Reference was made to cooling radiators of the thermo-plate type arranged in box formation, at a height about level with the top of the tank, a chimney being mounted on top of the box formation. The air flow was from the outside to the inside of the box horizontally, and was directed upward by a pyramid inside the box. No fan was employed, but for loads above half-load the oil circulation was increased by means of a pump.

For rural distribution it was becoming more popular to connect comparatively small 33-kV transformers direct to the 33-kV line without fuse protection. While the value of iron loss was really important, it must not be evaluated to the entire disregard of copper loss. In small transformers the voltage regulation at unity power factor was determined almost entirely by the copper loss, the effect of reactance being almost negligible. The important value of that feature lay in the fact that with poor regulation not only did service to the consumer suffer, but the income to the supply authority was reduced. Therefore, there was justification for building such transformers for small copper as well as small iron losses. Coupled with that feature, it was recommended that for transformers up to 50-kVA output the flux density should not exceed 11,000 lines per sq. cm., and for larger sizes it should not exceed 12,000 lines per sq. cm.

For rural distribution work the tank should be provided with an expansion vessel, bushings should be in the cover and easily detachable without removing the cover, and the tappings should be connected to an externally operated tapping switch.

A new scheme of combined high- and low-voltage distribution which was finding a useful application in sparsely populated areas was discussed. The Electricity Commissioners and Post Office engineers had agreed to modify some of their regulations, and one important concession was to allow the running of a high-voltage line, not in excess of 6.6 kV, on the same poles as the 400-V distribution wires, which resulted in considerable saving in line construction. To simplify the scheme further, one line of both single-phase or three-phase systems was earthed, which eliminated the necessity for a separate earth wire running throughout the system. Thus the transformer would work with its windings at a voltage above earth $\sqrt{3}$ times higher than it would normally on a system where the neutral was earthed, and the design must take account of that condition. Nevertheless, the scheme presented attractive features for certain rural applications.

With regard to on-load tap-changing equipment, the author recommended employing a mid-point auto-transformer because it greatly simplified the construction of the main transformer. He suggested that the cores of the mid-point auto-transformers should be designed with air gaps. On-load tap-changing should be made automatic.

The Ignition of Coal

A SYMPOSIUM on the ignition of solid fuel on a scale large enough to approximate to chain-grate stoker conditions was submitted to a joint meeting in London on November 25th of the INSTITUTE OF FUEL and the COMBUSTION APPLIANCE MAKERS' ASSOCIATION.

Three of the authors are members of the Association's research committee and in some of their experiments they employed electric radiators, heating coils and thermocouples for controlling temperatures.

The ignition point is defined by Messrs. P. O. Rosin and H. R. Fehling as representing the temperature at which the rate of heat evolution is greater than the rate of heat loss to the surroundings. It is not a critical state, or sudden transition; and is always well below the practical combustion temperature for all fuels and all methods of firing.

It is thus mainly significant for storage and transport; what matters in relation to combustion is not its magnitude but the time required to reach it. Ignition is a swift process of acceleration, non-stationary in character. Ignition from below by hot air shows that coal reacts at all temperatures; otherwise it would be impossible for the coal to warm the air, instead of the reverse, before ignition occurred. This is due to the fact that oxidation of the coal, although slow, develops enough heat to raise the temperature of the air, thus favouring ignition in the upper layers. The lower layers of coal act as an air preheater and the increasing resistance of the layer with time is due to the agglutination of the coal.

The primary ignition affects a very small and limited portion of the bed. Time must elapse before flame appears, presupposing a sufficiency of gases, the release of which depends both on temperature and heat transmission from the ignited nucleus. As soon as the bed is permeated by burning volatiles propagation of the combustion zone becomes rapid. This is a peculiarity of high-volatile coals with low moisture content.

With ignition from above by radiation the stages are plasticity, swelling, glowing and flaming. The extension of the process in depth is small. At the moment when the top layer glows and flame starts combustion (600 deg. C.) a layer 15 mm. deeper has scarcely reached 100 deg. C., while still lower layers are virtually unaffected. The heat conducted into the bed is almost entirely removed by the counterstream of air passing through it when the conditions favour convective heat transfer.

From the thermal mechanism it is deduced that external heat starts out as the dominating factor, but with falling effect as the coal temperature rises; while oxidation, from small beginnings, steadily grows until after ten minutes it becomes solely responsible for the temperature rise.

The ratio between the heat stored in the coal and that supplied by hot air or developed by oxidation becomes less as the process goes forward. There is a double reason for this. When the coal has reached the temperature of the hot air no more heat is stored, and as soon as the coal temperature is further increased by oxidation an appreciable proportion of the oxidation heat is carried off. The coal now heats the air instead of the reverse, and only the remnant of heat serves for raising its temperature.

The process includes a weak period from the seventh to the twelfth minute. External heating falls off before oxidation is in full swing. Higher temperatures with reduced air quantities would therefore be a sure method of shortening the ignition time.

Messrs. A. C. Dunningham and E. S. Grumell (Imperial Chemical Industries, Ltd.) conclude that ease of ignition varies inversely with the carbon content of a coal. At low air rates minimum inputs of radiant heat are required and the difference between coals is relatively small. As the air rate becomes greater the heat requirements increase and the differences between fuels are greatly accentuated.

Up to a limit of about 2 in. a larger size of fuel will ignite more easily than a smaller size, because the cooling effect of air passing through the bed is less with a larger fuel. A fine fuel when wetted ignites slightly more easily than when dry, probably due to the formation of larger aggregates. The effect of ash content is not very conclusive. Cokes ignite much less readily than coals and reactive cokes more easily than non-reactive.

Messrs. C. A. Seyler and T. E. Jenkins suggest that since the process is the result of a chemical change (oxidation) the relation between the rate of heat evolution and temperature can be represented by the Arrhenius law, in the case of coals varying from lignite to anthracite. They reported the discovery of this relation to the Malayan Colliery Co. in 1931 and to the Fuel Research Board in 1935.

Fire-damp Detection.—Professor W. H. McMillan, in an address to the ROYAL SCOTTISH SOCIETY OF ARTS at Edinburgh, dealt with the various methods which had been suggested, or had been tried out in practice, for detecting and estimating fire-damp in mines. For instance, a heated wire in the presence of a fire-damp mixture, containing less than 5½ per cent., caused flameless combustion to take place on the surface of the wire, and the heat so generated was imparted to the wire. This additional heat was proportional to the percentage of fire-damp present, and the increased glow might be measured visually, or by means of a small contrast photometer, or a photo-electric cell and microammeter; if the heating were done in a small closed vessel, the resultant reduction in pressure, due to the hydrogen of the methane combining with the oxygen, could be recorded; or the increased temperature of the wire measured physically by the bending of a bi-metal strip in its immediate neighbourhood, or even by fusion of the wire itself. Some appliances had been approved by the Mines Department, while others were undergoing tests at the present time.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Domestic Refrigeration Sales Efforts

Mr. Clifford has pointed out how the gas people sell refrigerators; here is another point. Every electrical salesman and every service man explains to his client: "The gas is evaporated . . ." or "The gas is condensed . . ." and so on. Would it not be better for him to use the terms "vapour" "freon" or "methyl." The constant repetition of "gas" advertises our rivals.

As to the relative problem of selling gas or electric refrigerators the trade has condemned trading by supply authorities and yet when they don't trade in a commodity they are still condemned. I suggest that electrical traders should go to the local gas showrooms and ask for the booklet on gas refrigerators. Then a comparison should be made with an electrical refrigerator—British for preference—in capacity, ice-making, shelf room, initial and running costs. There in the gas companies' own figures will be found all the selling points needed. I make this point because it is my own practice.

I find that electrical traders have not yet appreciated the cash value of the refrigerator business—they have hotels, boarding houses, private users, grocers, butchers, fish merchants, doctors, &c., and in ten years' time every block of flats will be totally equipped with refrigeration. The time to sell refrigerators is not just in summer, but now. Last year I sold fifteen as Christmas presents. EVAPORATOR.

November 20th.

On the Gold Coast

I was particularly interested in Mr. Raymond Berry's letter in your current issue as I once spent a year or two supervising the "Electric Shop," Presta, Gold Coast Colony. The explanation is that Presta is the location of one of the most important gold mines in the colony. It is therefore not really surprising that the ELECTRICAL REVIEW finds its way there.

The other side to the picture is shown in the enclosed cutting from the *Manchester Guardian*, which appeared on the same day. The West African is undoubtedly fascinated by catalogues and anxious to possess the wonders disclosed therein. The system of monthly payment of wages, however, results in general credit trading and in practice continuous mortgaging of wages. Unless a C.O.D. parcel arrives just before payday, therefore, it probably cannot be collected. It would, in my opinion, be better both for West African and for supplier if cash with order were insisted on.

Just a word about the letter. It is amusing like most of the West African's letters in English, but we mustn't forget he writes in a language not a bit like his own. His electrical ability I can vouch for as being of a much higher standard.

CHARLES F. FREEMAN.

Coventry, *November 21st.*

[The *Manchester Guardian* note reported the abandonment of the C.O.D. system in Nigeria owing to the "vast accumulation" of unclaimed parcels in the Post Office.—EDS., ELEC. REV.]

East Ham Sub-station Fire

The leaderette headed "The Dividing Wall" in your issue of November 12th dealt mainly with the importance of the fire-protection wall and made the statement that the fire originated in the breakdown of a 15,000-kVA transformer.

As manufacturers of the transformer in question we must ask you to correct this statement. In fact, a fault occurred on some of the external connections and the arc spreading went to earth on the transformer radiator. As a result, the radiator was punctured and the stream of oil was ignited by the arc. There was no fault on the transformer.

THE BRITISH ELECTRIC TRANSFORMER CO., LTD.,
R. WEAVING, Manager.

Hayes, *November 17th.*

Earth Leakage Trips

I am in complete agreement with the last phrase in Mr. Gilbert's letter in your issue of November 12th, ". . . . everything turns upon the time that this (the fault) is likely to be maintained," but if the voltage is not high enough, the leakage device will not operate and the time becomes infinite. Whether the circuit-breaker will operate in one cycle or one hour at a voltage above its tripping value is immaterial; we are considering the case when the voltage is below the tripping value. Since on Mr. Gilbert's admission earth leakage circuit-breakers in Germany need not operate till the voltage is 65 V (when the soil resistivity is high) it follows that if the fault voltage is less than this it may remain on indefinitely, a condition which cannot be reconciled with the requirement made in his article and repeated in his letter, that "30 V is certainly to be avoided, whatever the earth resistance." This is all I wish to demonstrate. H. G. TAYLOR.

London, W.C.2, *November 17th.*

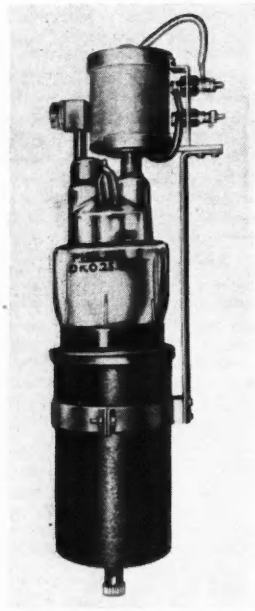
D

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Thermionic Rectifier Valve

The latest thermionic rectifier valve offered by PHILIPS INDUSTRIAL, 145, Charing Cross, Road, London, W.C.2, for industrial uses is a metal-clad single-phase type. The cathode is a pool of mercury at the bottom of a chrome-steel cylinder, which is cooled by a continuous flow of water between it and an outer metal jacket. A special protective device operates in conjunction with the cooling system. The main anode is formed of a graphite compound and the striking of the arc is assisted by an auxiliary anode which is withdrawn magnetically from the mercury pool. Both arc and ignition electrodes are held by a glass-to-metal (chrome-steel) hermetical seal at the top. Since neither vacuum pump nor condensing chamber are needed, the weight and dimensions can be kept small. The rating is 75 A, but it will deliver a peak of 300 A.



The Philips rectifier valve

Vacuum Gauges

A rubberless McLeod gauge for the measurement of high vacua is being introduced by W. EDWARDS & CO., Vaughan Road, London, S.E.5. All parts in contact with mercury are of stainless steel or iron except the removable gauge head. The mercury reservoir is designed to be unspillable and unbreakable. A quickly fitted calibrated head is fixed to a vertical steel tube by a joint sealed with vacuum wax. Dimensions are 5 ft. 8 in. by 1 ft. 3 in. by 1 ft.

Three types are available with ranges in mm. of Hg. of from 0.1 to 0.00001, 2.0 to 0.001 and 10 to 0.01. For factory use a gauge provided with an illuminated scale and enclosed in a metal casing supported on a tripod with levelling screws has been developed. Connection to the high vacuum system is made by a metal joint projecting from the top of the instrument. Only the calibrated head and observation window are of glass, the rest being of metal.

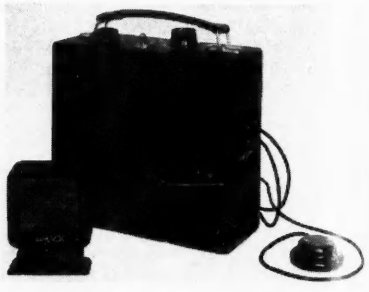
Left: An enclosed gauge. Right: A rubberless gauge

Where a more compact all-glass system than the full-length McLeod gauge is required, a bench model, 2 ft. 2 in. high from tripod and 6 in. wide, can be supplied. In this type air entering through the capillary bore of the two-way tap connected to the reservoir forces mercury up into the centre tube to give a reading. To lower the mercury the tap is turned to the other arm, which is connected to a rough vacuum, and the air is thus withdrawn from the mercury reservoir. Measuring ranges and standard heads are similar to those supplied with the rubberless patterns.

For indicating or recording rapid fluctuations of total pressure, a direct-reading Pirani-type gauge is available. The standard instrument operates on a.c. mains between 200 and 250 V, 50 cycles, readings being independent of normal voltage fluctuations. The dial indicator is 3½ in. in diameter. For laboratory use the electrical components can be housed in the same teak cabinet as the indicating instrument but for industrial purposes the indicator may be mounted at a distance with its gauge tube protected by a metal case. Deviations from the standard model can be provided to meet special conditions and various ranges between the limits of 10 and 155 mm. are supplied.

Aids to Hearing

Aids to hearing made by AMPLIVOX, LTD., 106, George Street, Portman Square, London, W.1, are designed on valve amplifier principles with good quality microphones. Since the new research department was opened eight months ago a new range of instruments has been produced. One of them is claimed to be first commercial all-mains deaf-aid for individual use without batteries. The dimensions of the amplifier carrying case are 7 in. by 7 in. by 3 in. and its weight is 4 lb. Three valves are employed with automatic volume reduction to prevent overloading the ear when the sound input is loud. There is a three-position switch to adjust the output characteristics to the most common forms of deafness. A separate plug-in microphone is of the piezo-electrical crystal type and a relative amplification of about 70 decibels is claimed, say, ten million times.



The Amplivox mains model deaf aid equipment

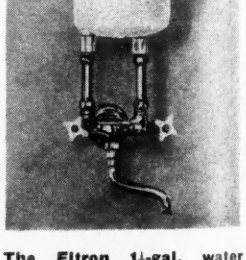
Another outfit for use with a plug-in earphone has both microphone and three-stage valve amplifier combined in a carrying case measuring 6 in. by 3 in. by 4 in. and weighing 3 lb. The anodes are energised by an ordinary 45-V dry battery and for heating the filaments a 3-V dry battery or small accumulator may be used. The frequency range of the combination is 50 to 10,000 cycles and the amplification 55 db.

A third instrument is similar. The microphone and three valves are in one unit that will go into the waistcoat pocket, while the container of the batteries is small enough to fit into the jacket pocket and it weighs under 2 lb.

A Dual Element Water Heater

An unusual heating arrangement employing two elements is incorporated in the new type D.S.8 electric water heater of ELTRON (LONDON), LTD., Salisbury Square House, London, E.C.4.

The water is heated by upper and lower elements. When water is drawn off the upper element first heats about ¾ gal. of water to 185 deg. F. The thermostat then switches on to the lower element, which brings the remainder of the water up to 185 deg. F., when the supply is cut off, only one element at a time being in use. This permits a much smaller storage tank to be used than would normally be employed. Because of these features the heater is suitable for dentists' and barbers' use and places where small quantities of water are continually required. Hot water can be drawn off within ten minutes of filling up.



The Eltron 1½-gal. water heater

Industrial Lighting Fittings

Two additions to the range of industrial lighting fittings manufactured by THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, are of interest. They are both designed for installation in damp, steamy atmospheres, such as laundries, etc., and are of the totally enclosed type, consisting of white opal glassware with screw-necks, and white porcelain tops with porcelain b.c. or e.s. lampholders. They can be obtained with a suspension loop with a 6-in. diameter globe or tapped for ¾ in. conduit with either a 6-in. or 8-in. diameter globe. The smaller size is designed to house a 40- or 60-W lamp, while a 100-W lamp is recommended for the larger size.

Electrical Presents for Christmas

Some suggestions for the display and selling of appropriate gifts

TWENTY-NINE days to Christmas!—probably the greatest small appliance selling opportunity of the year. Electrical appliances are labour-saving appliances, and the pull of labour-saving is perennially strong. But, results depend upon bringing these to the public eye.

The methods are many and the electricity showroom, be it retailer's or supply undertaking's, offers unrivalled opportunities. The demand at Christmas is specialised. It concerns almost exclusively *small* appliances, and price plays a more than usually important part. Half the prospective customers will arrive wanting presents costing not more than a certain amount but may not know exactly what they want as they usually do when they visit the showrooms. One method of catering for this is to have a number of tables in the showroom marked with prices—say up to 10s., 10s. to £1, £1 to £2, &c.

A customer buys an electric kettle at the L.A.E.U. showroom, Earls Court . . . . . .

. . and examines it at home before sending it to her friend [*Elec. Rev. photos.*

Everyone has an instinctive desire to try apparatus, and having done so is inclined to buy. The showroom should, therefore, have several plug points available, as well as a board for ironing, bread for toasting (not forgetting the butter), coffee for percolators, and so on. In many cases special demonstration appliances will have to be available, instead of using new ones. If there is room, complete cooking demonstrations should be carried out frequently during the fortnight before Christmas.

Yuletide is essentially the children's time, and a great deal can be gained by appeal to them. For instance, it might be announced that all children, accompanied by their parents, who visit the showroom, will be given a present from a Christmas tree in the window. The gift can be quite inexpensive, and while it is being handed out, the parents can look round the showroom. But it is important that they should not feel that they are being pressed to buy. When they leave a folder can be handed to them which illustrates suggestions for electrical presents.

The Christmas tree itself should be well decorated with fairy lights, with full boxes of them at the side of the tree. Stress, with the aid of a printed showcard, should be laid on the fact that there is no risk of fire. The exhibition of an electric model train and an all-electric doll's-house would stimulate the interest of the older children, besides opening up the possibility of other sales.

All this necessitates a large stock, and the more lavish displays will only be possible to larger concerns, but one of the vital necessities, the checking up of stock, is quite as important for the one-man retailer as for the large undertaking. As a guide to possible demands for the Christmas present trade we give at the top of the next page a complete list of suitable electrical gifts. It is impossible to arrange them in any definite price order, since individual makes and qualities vary widely in prices—one can, for instance, pay 7s. 6d. or 50s. for an electric iron.

From the showroom we turn to the window, which is of relatively greater importance for the small retailer who has little space for internal display. The question arises whether massed or feature display is to be preferred. Both have their advantages. When there is not much opportunity for a successful display within the shop the massed display offers a way of exhibiting as many appliances as possible. Where, however, these may be inspected at leisure inside, a clever

She's sensible!
KNOWING THE ADVANTAGES OF Electricity
SHE'S GIVING ELECTRICAL Gifts THIS YEAR
Like a gift that GIVES AGAIN
Make all your gifts this CHRISTMAS
ELECTRIC GIFTS

A decorated Christmas tree (above) is an attraction to old and young alike (*G.E.C. photo*)**; (left) the prize-winning display of the County of London Co. (Romford) and (right) the E.D.A. Christmas window display No. 1**

The E.D.A. poster should be displayed at once

[Elec. Rev. photo.

feature display will arouse more interest.

The Electrical Development Association has issued three displays costing from £2 17s. 6d. to £4 11s. 6d. (illustrated), and several small displays units about 2 ft. square costing from 12s. to 16s. 6d., while the artistic mind will be able to devise many striking sets with the aid of cardboard, showcards and crêpe paper, the last serving excellently for snow. The County of London Co.'s (Romford) prize-winning display illustrated is an excellent example of this type.

Advertisements in the local press form a useful link-up with those that E.D.A. have just begun in the daily papers—it might, however, be deemed more profitable to illustrate irons, toasters, kettles, &c., rather than sunlamps at £18 and refrigerators costing £30, while most retailers will be able to advertise a wide range of appliances at much less than the prices mentioned by E.D.A.!

Besides advertisements, calenders and posters are an effective means of publicity and both these, together with folders illustrating electrical presents can be obtained for a reasonable charge, with a space for overprinting, from E.D.A. It is essential, however, that advertising should be carried out in good time, even before the displays are ready.

In preparing these advertisements one of the main aims should be to get the public to visit the showrooms to establish personal contact, which is likely to bring a reward long after the Christmastide rush.

POSSIBLE PRESENTS	
Tea-making outfit	*Cupboard airer*
Coffee percolator	*Foot muff*
Toaster	*Door bell*
Plate warmer	*Fan*
Food mixer	*Shaving mirror*
Kettle	*Shaving mug*
Egg boiler	*Razor*
Waffle maker	*Hairdryer*
Porringer	*Curling tongs*
Hot-water jug	*Curling-tongs heater*
Milk warmer	*Bedlight*
Saucepan	*Heating pad*
Griller	*Blanket*
Casserole	*Bed warmer*
Drink mixer	*Cigarette lighter*
Clock	*Trousers presser*
Immersion heater	*Fire*
Iron	*Soldering iron*
Floor standard	*Decoration lamps*
Table lamp	*Towel rail*
Sewing machine lamp	*Vacuum cleaner*

Electrical Imports of Peru

Substantial increase during 1936

PERU'S foreign trade returns for 1936 show a further advance in imports of electrical goods. The leading items are given below in the form of a comparative statement of the 1936 and 1935 figures, together with the shares of the principal countries participating in the trade. It will be seen that increases took place in all the principal groups and that Germany had a good share throughout. In the electrical trade as a whole competition comes from many different countries. As a number of new headings have been raised strict comparison with 1935 is not always possible. Prospects of further development are uncertain because of the downward tendency of the prices of cotton and metals, and stocks of imported goods generally in the country are said to be heavy. The total value of the imports of electrical apparatus and appliances last year was 9,730,000 soles (compared with 6,642,000 soles in 1935), the United States retaining its leading position with 4,051,000 soles and Germany coming next with 1,863,000 soles, an increase of 810,000 soles on 1935 (£1=17 to 20 soles). It is possible that some heavy electrical plant is also included under the heading "Machinery for Industry." In this group the United Kingdom has substantially increased its share.

	1936 Soles. (Thous.)	Inc. or dec. Soles. (Thous.)
Switches, circuit-breakers and similar accessories—		
Total	394	+ 74
From Germany	176	+ 68
„ Italy	14	— 5
„ United States	155	+ 13
„ United Kingdom	22	+ 4
„ Japan	13	— 6
Accumulators and batteries—		
Total	335	+ 65
From Germany	41	+ 25
„ United States	235	+ 30
„ United Kingdom	23	+ 12
„ Japan	14	— 3
Insulators—		
Total	82	+ 36
From United States	39	+ 17
„ United Kingdom	11	+ 4
„ Germany	27	+ 13
Insulated wire and cable—		
Total	1,530	+ 320
From Germany	765	+ 430
„ United States	345	+ 130
„ United Kingdom	137	+ 77
„ Holland	27	+ 16
„ Japan	5	—
Telephone apparatus—		
Total	284	+ 119
From Belgium	192	+ 77
„ United States	35	+ 22
„ United Kingdom	21	— 6
Radio apparatus—		
Total	1,716	+ 56
From Germany	79	+ 65
„ United States	1,490	— 50
„ United Kingdom	106	+ 26
Radio valves—		
Total	75	*
From United States	67	*

	1936 Soles. (Thous.)	Inc. or dec. Soles. (Thous.)
Cooking and heating apparatus (including industrial)—		
Total	343	— 457
From Germany	207	+ 100
„ United States	90	— 515
„ United Kingdom	2	—
„ Switzerland	25	— 40
Unspecified electrical goods—		
Total	177	+ 85
From United States	161	+ 105
Insulating tape—		
Total	30	+ 4
From Germany	9	+ 4
„ United Kingdom	1	— 1
„ United States	17	—
Ammeters, galvanometers, etc.—		
Total	113	+ 36
From United States	56	+ 7
„ United Kingdom	35	+ 29
House meters—		
Total	153	+ 85
From Germany	101	+ 44
„ Canada	45	+ 42
Refrigerators—		
Total	472	*
From United States	467	*
Lamps, up to 50 W—		
Total	208	+ 8
From Germany	49	— 29
„ United States	73	+ 31
„ United Kingdom	7	— 1
„ Holland	12	— 6
„ Japan	46	+ 2
Lamps, over 50 W—		
Total	195	— 20
From Germany	28	— 35
„ United States	81	+ 7
„ United Kingdom	8	—
„ Holland	32	— 28
„ Japan	7	+ 2

	1936 Soles. (Thous.)	Inc. or dec. Soles. (Thous.)
Magnetos—		
Total	17	— 7
From United States	15	— 7
Electro-magnetic apparatus (medical)—		
Total	215	+ 147
From United States	62	+ 3
„ Germany	150	+ 142
Fractional h.p. motors—		
Total	44	+ 9
From United States	33	+ 3
„ Germany	2	— 1
Dynamos—		
Total	117	*
From Germany	39	*
„ United States	17	*
„ Great Britain	45	*
Switchboards—		
Total	763	+ 321
From Germany	55	+ 26
„ United States	44	+ 13
„ United Kingdom	36	+ 16
„ Belgium	625	+ 295
Transformers—		
Total	406	+ 260
From Germany	54	+ 19
„ United States	250	+ 185
„ Switzerland	53	+ 18
Insulating tubes—		
Total	102	+ 51
From Germany	10	— 7
„ United States	67	+ 42
Fans—		
Total	22	+ 10
From United States	17	+ 10
Machinery for industry (other than textile, agricultural, mining, meat-packing and printing)—		
Total	6,253	+ 1,113
From Germany	2,013	+ 653
„ United States	1,259	— 805
„ United Kingdom	1,720	+ 1,000

* Comparative figures not available.

World Power Conference

A sectional meeting of the World Power Conference is to be held in Vienna from August 25th to September 2nd, 1938, and will be followed by one or more "study tours" of about a week's duration. The subjects to be discussed are the supply of energy for agriculture, small-scale industries, household purposes, public lighting and electric railways. Further information is obtainable from the British National Committee, 36, Kingsway, London, W.C.2.

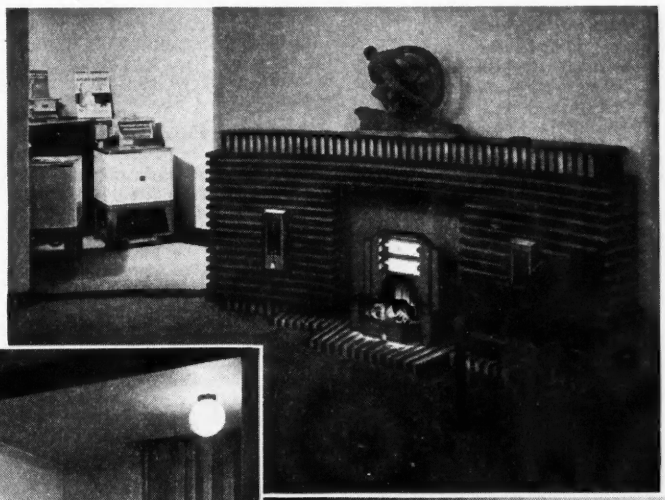
A New Domestic Appliance Showroom

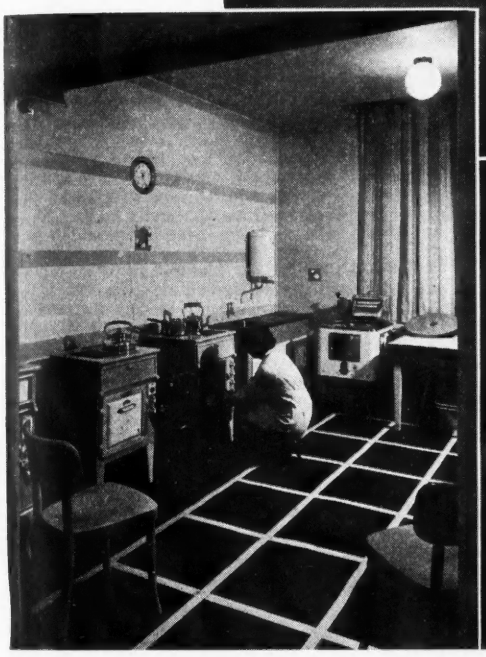
A SPACIOUS new showroom constructed on the most up-to-date lines has just been opened by the English Electric Co., Ltd., at Queen's House, Kingsway, London, W.C.2, for the special purpose of displaying and demonstrating the company's domestic appliances. In the design the architects (Messrs. Farmer & Dark) have paid special attention to providing an uncrowded and suitable setting for appliances which shows them to the best advantage. By the use of open-backed non-reflecting type windows a large proportion of the apparatus can be seen by passers-by.

Almost the whole of one side of the showroom is utilised for the display of fires, a black "Vitrolite" counter with glass pillars furnishing not only an excellent non-glare background for inset models, but also a useful stand for many of the portable models. On the opposite side of the room the front portion accommodates representative examples of cooking equipment. Behind this, one on each side of a brick fireplace demonstrating imitation coal and inset fires in their correct surroundings, are small alcoves containing typical water heaters and washers. A small space has been reserved for some of the lighter types of switchgear.

Tastefully decorated in cream and green, a model all-electric kitchen is equipped with various types of cookers, a water heater, washing machine, ironing cupboard, &c., together with a large-scale meter showing "units" consumed. This room, Mr. E. Winterbottom, the showroom manager, tells us, is intended primarily for "demonstrations to demonstrators."

Throughout the showroom the utmost use has been made of decorative lighting, the total lighting load being 32 kW. A soft illumination and a modern effect are both achieved by concealing tubular lamps (Linolite) in coves forming part of the massive pillars suporting the ceiling. Strip lamps, hidden behind the top of the display counters mentioned, illuminate the inset fires. Spot lights operated by time switches pick out successively selected apparatus on the counters or on the revolving display stands. Novel fittings by Troughton & Young, Ltd., provide the general lighting.





Sections of the well-equipped new showrooms opened by the English Electric Co., Ltd., at Queen's House, Kingsway. Left: A model all-electric kitchen. Right: Portion of the fire display. Above: A mantel showing imitation and inset fires at the entrance to the washing machine showroom

Parliamentary News (BY OUR SPECIAL REPORTER)

Battersea Power Station

Sir William Davison asked the Minister of Health whether he was aware that it was proposed to install further boilers and generating plant at the Battersea power station; and whether he was satisfied that this extension would not be injurious to health or atmospheric conditions in West London.

Mr. Bernays said that the Minister had satisfied himself that there was no objection to this extension on grounds of danger to public health or of atmospheric pollution.

Calcium Carbide Committee

Captain A. Evans asked the Minister for the Co-ordination of Defence if he was now in a position to make any statement with regard to the report of the Calcium Carbide Factory Investigation Committee; and whether it would be possible to make arrangements to encourage the erection of such a factory in South Wales.

Sir T. Inskip said that the Committee, after full consideration of a number of schemes submitted to it for the production of calcium carbide and allied products in the United Kingdom, recommended the scheme submitted to them by the British Oxygen Company. This scheme provided for the erection of two factories, one at Port Talbot in South Wales, the other at Corpach in the West Highlands. The company had assured him that pending the obtaining of the necessary powers for the Corpach factory it intended to proceed at once with the erection of the factory at Port Talbot. On this basis the scheme was regarded by the Government as satisfactory and he understood that the company was taking the necessary steps to re-introduce the Caledonian Water Power Bill into Parliament.

Proposed South Wales Amalgamation

Captain A. Evans asked the Minister of Transport on November 18th whether the proposed amalgamation of electricity concerns in South Wales in any way conflicted with the proposals of the Government for giving effect to the McGowan Report.

Mr. Burgin said he had no official information of the proposed amalgamation referred to. He would add that, in advance of a detailed investigation and without hearing the views of all interests concerned, it would not be possible to say to what extent particular proposals could be accepted as giving effect to the principles of the McGowan Report.

Business and Industrial Notes

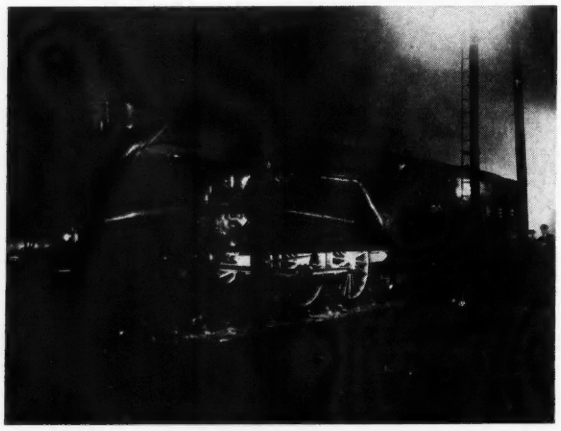
The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Wages in the Cable-making Industry

The Ministry of Labour cost of living index figure for November 1st, 1937, is 60 per cent. above the 1914 level and will not involve any alteration in wages in the cable-making industry on the third pay day in December so far as male time workers (21 years of age and over) and female time workers are concerned. The Joint Industrial Council for the Electrical Cable-making Industry, however, at its meeting on November 17th decided to increase the pay of youths and boys (time-workers) under twenty-one years of age, the advance to come into force on the third pay day in December. In District No. 1 the increase for youths and boys ranges from 5½d. to 1s. 5½d. per week, and in district No. 2 from 6d. to 1s. 6d. per week.

Locomotive Inspection

The London & North Eastern Railway Co. has introduced an innovation for the inspection of its "10,000" streamlined locomotive. In order to carry out inspection at night, lights



The L.N.E.R. locomotive, "10,000," with electric lamps concealed in the underpart of the engine [*Elec. Rev. photo.*

are hidden in the under part of the engine, while electric lighting has been installed on the driver's platform. Current is generated by a dynamo under the streamlining.

Employment During October

Employment during October in the engineering industry showed little change, and continued good on the whole, being very good in electrical engineering. According to the *Ministry of Labour Gazette*, the total number of unemployed in the engineering industry was 57,875 or 4.9 per cent., an increase of 0.1 per cent. as compared with September, but a decrease of 1.3 per cent. as compared with October, 1936. In the electrical engineering section the number of unemployed was 304 or 3 per cent. (3.5 per cent. in October, 1936). The unemployed in the electrical wiring and contracting industry numbered 3,499 or 8.5 per cent. (9 per cent. in October, 1936). In the cables, apparatus, lamps, &c., group the unemployed numbered 7,835 or 4.4 per cent. (4.8 per cent. in October, 1936).

Electricity Supply Workers' Wages

A settlement has been reached on a claim by men employed in the generating and distributing sections of the supply industry in Great Britain. As from December 1st these workers will receive an increase of ¾d. per hour on the scheduled rates. The increase will apply to 68,000 operatives.

West African Electrical Imports

The British dependencies in West Africa provide a favourable market for United Kingdom goods. Mr. H. F. Gurney, one of H.M. Trade Commissioners, in his report to the Department of Overseas Trade on the economic and commercial conditions there, states that it is difficult to point to any one item where a large volume of business could be transferred from foreign sources, and importers must look to a variety of lines in which a slightly increased United Kingdom share might be obtained. Dealing with electrical imports, Mr. Gurney states that practically the whole of electrical and telegraph apparatus imported into Sierra Leone in 1936 came from the United Kingdom, which also supplied most of the machinery. In the Gold Coast there has been a considerable increase in the imports of electrical and telegraph apparatus. In 1935 the value was £66,200 and in 1936 £93,700. The United Kingdom enjoys the major part of this trade. Imports of electrical machinery were valued at £199,844, the United Kingdom sending £197,790. Electrical and telegraph apparatus imported into Nigeria is mainly for the Government, but there is likely to be an expanding market for domestic electrical appliances.

Overhead Equipment for L.N.E.R. Electrification

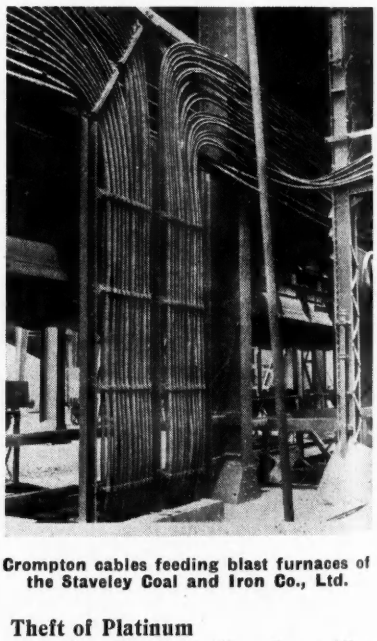
The London & North Eastern Railway Co. has placed contracts with British Insulated Cables, Ltd., for the overhead line equipment required in connection with the Manchester-Sheffield main line and Great Eastern suburban electrification schemes to the total value of over £1,000,000. These two contracts include the design, manufacture and erection of the complete overhead line equipment on the main line between Manchester and Sheffield, together with the branch line to Wath-on-Darne, seventy-five route miles, and also that required for the suburban lines from Liverpool Street and Fenchurch Street Stations to Shenfield, twenty-five route miles. The single track miles concerned amount to 300 and 100, respectively, making a total of 400 single track miles to be equipped. The line between Manchester and Sheffield has heavy gradients, and includes the Woodhead Tunnel, which is three miles in length. The overhead line conductor system, using d.c. at 1,500 V, is the higher voltage standard system authorised by the Minister of Transport. In connection with these two contracts, it is estimated that about 8,500 tons of steelwork, 3,000 tons of copper, and many thousands of insulators and other fittings will be required, and it is hoped that the work will be completed in from two and a half to three years.

A Scottish Illumination Design Course

The E.L.M.A. Lighting Service Bureau of Scotland has just completed a successful design course covering the various applications of illumination. The course was held in Edinburgh and was attended by 1,492 people. The programme given covered six meetings and an outstanding feature of the attendance was the co-operation of the electrical contractors, who formed about 50 per cent. of the total audiences. The lectures were as follows:—"Modern Methods of Illumination Planning" and "Modern Shoplighting," by Mr. M. W. Hime; "Lighting for Seeing," by Mr. A. D. S. Atkinson; "Electric Light Sources and their Characteristics," by Mr. W. J. Jones; "Floodlighting Practice in Commerce and Industry," by Mr. H. Lingard; and "Modern Industrial Lighting," by Mr. R. O. Ackerley.

Electrically Operated Blast Furnaces

During the past few years the Staveley Coal & Iron Co., Ltd., has completely electrified three of its blast furnaces. Approximately six miles of Crompton cable were required for both power and sequence operation. It was essential that the cable should be able to stand up to rough usage and be impregnated against moisture and variable temperatures. The furnaces are completely automatic. They are operated by push-button control both from the skip control house and the electric scale car platform.



Crompton cables feeding blast furnaces of the Staveley Coal and Iron Co., Ltd.

Theft of Platinum

At Liverpool Assizes on November 18th, Albert James Allen (49), of Liverpool, formerly departmental foreman at the works of the Automatic Telephone and Electric Co., was sentenced to three years' penal servitude. He was said to be the head of a conspiracy to steal and dispose of over £1,000 worth of platinum from the works where he was employed. His assistant foreman, William Elliot (40), of Wallasey, who also

pleaded guilty to conspiracy, was sentenced to eighteen months' hard labour. A third defendant, Daniel Griffin (71), and trading as Lewis McQueen, of Liverpool, a pensioned ex-employé of the complainant firm, was found guilty of the larceny of £175 worth of electrical equipment and of conspiracy to dispose of the stolen platinum, and was sentenced to twelve months' hard labour.

It was stated that over 100,000 contact springs, from which platinum contacts had been extracted, were recovered in boxes from the homes of the accused Allen and Elliot. A large assortment of electrical equipment, together with telephone and telegraph apparatus was found at Griffin's address.

The Wireless Trader Year Book

The 1938 edition of the *Wireless Trader* Year Book, which has just been published, while retaining the standard radio features, has been specially revised and enlarged to cover the needs of both radio and electrical traders. The main directories (which include references for radio and domestic electrical trades) comprise a buyers' guide arranged under about 300 different headings; lists of trade addresses, giving 1,500 entries; directories of radio and electrical wholesalers; and a list of proprietary names containing 1,400 entries. Detailed specifications are given of 578 1937-38 radio receivers marketed by forty-nine manufacturers. There are also lists of mains voltages for nearly 1,200 districts, valve reference tables for about 800 different types and makes, together with British and American valve base connections. Other information given includes trade associations and legal regulations affecting trading, public performance, manufacturing, patenting, trade marks, hire-purchase and television. A diary for 1938 is included. The book is published by the Trader Publishing Co., Ltd., Dorset House, Stamford Street, London, S.E.1, at 7s. 6d. post free.

Local Exhibitions

The first electrical exhibition to be held in the Lowerhouse district under the auspices of Burnley Corporation Electricity Department proved a great attraction. Cookery demonstrations were given by the General Electric Co., Ltd., and cake and bread competitions were organised. The newly formed branch of the Electrical Association for Women had a stand for the distribution of literature.

A Modern Homes Exhibition, organised by Mr. L. Batley, was opened on Friday last in the Cambridge Hall, Southport, by the Deputy Mayor, Councillor H. W. Barber, who is also district manager for Johnson & Phillips, Ltd. The exhibits include a wide range of electrical appliances for the home. In the course of his opening speech Councillor Barber said that when an exhibition of the kind was held it was often described as being detrimental to local shopkeepers. That did not apply in that case, however, for 50 per cent. of the exhibitors were from Southport, while the others were those whose names were known all over the country. The exhibition closes to-morrow (Saturday).

Bargoed Shopping Week

During the recent shopping week in Bargoed the local electricity supply company made a special effort to increase the popularity of electric cookers. In this direction Falk, Stadelmann & Co., Ltd., supplied a model cooker and a chef's outfit.

An electrical window display during the Bargoed Shopping week

The accompanying illustration shows a window display arranged by the supply company, a feature of which was a Falk, Stadelmann "Servis" cooker.

Electrical Contracting in Manchester

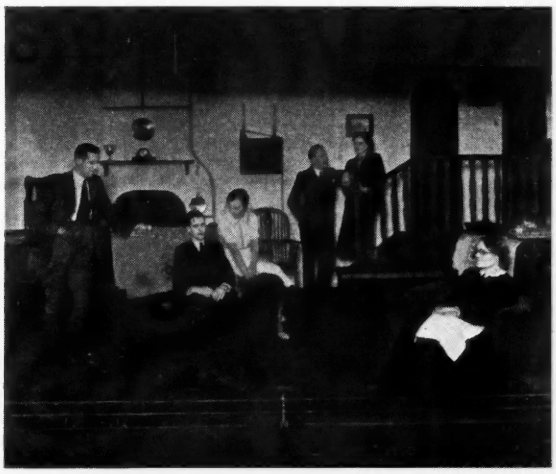
Members of the Manchester Electrical Circle held a meeting last week and discussed a number of questions of importance to electrical contractors, particularly with reference to canvassers and prospecting for new wiring work. It was decided to defer until the next meeting the question of whether it was advisable to have a standard rate of wages for canvassers. Another point which will be discussed at the December meeting is the desirability of obtaining some adjustment in the terms for assisted wiring schemes from the supply authority.

Busbar Distribution

In our last week's description of the Redditch spring works of Herbert Terry & Co. we mentioned the busbar distribution system, stating that we believed it to be the first equipment of its type to be installed with four bars so as to provide both three-phase power supplies anl phase-to-neutral lighting. The Power Centre Co., Ltd., Liverpool, informs us that it has been supplying this type of distribution for a number of years. One notable installation which was made from the company's manufactures by Drake & Gorham, Ltd., was that installed in D. H. Evans's new store two years ago.

Social Events

The Lancashire Electric Power Co.'s staff dramatic society presented "The Shining Hour," by Keith Winter, at the Queen's Hall, Manchester, on November 10th, 11th and 12th.



A scene from "The Shining Hour," recently performed by the L.E.P. Dramatic Society

After the final curtain Mr. C. D. Taite, president of the Society and engineer and manager of the L.E.P., congratulated all members of the cast upon their splendid performance and declared that Mr. Stuart M. Rix, the producer, and all those behind the scenes deserved great praise for their presentation of the play. Mr. Rix, responding, recalled that the society commenced only three years ago, since when four shows had been given. They had attempted to improve on each occasion and he hoped that the audiences would agree that on the present occasion they had improved on their previous efforts. Mr. Rix also paid a special tribute to those who worked behind the scenes.

The Empire Exhibition at Glasgow

Further details relating to the Empire Exhibition which is to be held at Ballahouston Park, Glasgow, from May to October next year are contained in a well-illustrated brochure just published. Apart from individual displays by the Home Country, Scotland, Canada, Australia, New Zealand, South Africa, the Irish Free State and the various Colonies, there will be a conference hall seating nearly two thousand, a Palace of Arts, and three large pavilions showing the products of engineering and industry. The Amusement Park, too, it is said, will be the finest Great Britain has ever known. Floodlights will accentuate the colour-scheme which encompasses the whole Exhbition, while searchlights from the top of a 300-ft. tower will give visitors a view far into the Highlands. The electrical services will be sufficient for a permanent city of half a million inhabitants, and ten sub-stations will be used to distribute the electricity for the million candle-power illuminations through thirteen miles of underground cables and 240 miles of wiring. It is estimated that the Exhibition will cost, directly and indirectly, £10,000,000, and six months before the opening date not a single foot of its 175 acres remains unsold. At least 15 million people are expected to attend.

Exhibition of Insulating Materials

An interesting exhibition of high-frequency ceramic materials and synthetic resin mouldings showing their various applications to the electrical and radio industries is being held this week at the Hotel Great Central, London, N.W., by the United Insulator Co., Ltd., which is the sole agent in this country for the Hermsdorf-Schomburg Insulator Co. (Hescho). The wide range of ceramic materials available with different dielectric constants and temperature coefficients makes it possible, by the use either of one or a combination, to meet practically any requirements. The materials are claimed to be 60-70 per cent. stronger than the best porcelain and to shrink only half as much. They can be cast or moulded, drilled or ground and can even be supplied in flexible forms for certain types of coils, &c. We were particularly impressed by the accuracy of the grinding, most of the articles displayed being true to within 1/100 mm. There is apparently practically no

limit to the size, large or small, to which the materials may be worked. It is possible to melt metal into the ceramics, permitting subsequent soldering or welding together of various components; in fact, any combination of ceramic, metal or glass can be fused together vacuum tight. The ability to metallise also renders possible a far greater stability in variable inductance coils, &c., requiring utmost accuracy, the metallisation itself forming the windings. The ceramics can be glazed in any colour. Among the comprehensive display of items on view are temperature coefficient regulating devices, metallised ceramic variometers, ceramic trimmers, silvered mica condensers, electrolytic and paper condensers, ceramic rods and tubes. An exceptionally high impact and tensile strength is claimed for the "Albert P.T." moulding materials, which can be seen made up into such articles as cable separators, fractional h.p. motor casings, hair-dryer cases, switch covers, terminal blocks and junction boxes. The exhibition closes this evening (Friday).

Leicester Contractors' Dinner

The Deputy Lord Mayor of Leicester (Alderman A. H. Swain), Councillor J. Minto (chairman of the Corporation Electricity Committee), Councillor J. W. Wale (vice chairman), and Mr. J. Mould (chief engineer and manager of the Electricity Department) were guests at the dinner at the Grand Hotel, Leicester, on November 16th, of the Leicester Branch of the Electrical Contractors' Association. Mr. F. H. Webb presided. In proposing the toast of "The E.C.A." Councillor Minto said that the members of the Association were looked upon as ambassadors of electrical commerce. Mr. F. J. Smith responded. Various branches were represented, including Loughborough and Peterborough.

British East African Electrical Imports

In his report to the Department of Overseas Trade on the economic and commercial conditions in British East Africa Mr. A. E. Pollard, H.M. Trade Commissioner, states that imports of electrical goods and apparatus imported during 1936 presented no special features. The total value of such imports was £114,362, as compared with £104,114 in the previous year, the principal supplying countries being the United Kingdom (£93,456), Germany (£5,237), and the United States (£2,568). The value of telegraph and telephone instruments and apparatus imported on Government account from the United Kingdom showed an increase of about £8,000. Electric lamps continue to be purchased in considerable quantities from Japan at an average price c.i.f. East African Port of about 2d. each. There is also a large importation of small lamps for use in hand torches at a c.i.f. price of 1.5 cents each, or nearly 70 for 1s. During the past year imports of torch lamps into Kenya and Uganda from Japan numbered 227,938, valued at £162, and large quantities of these small lamps were undoubtedly included in the total imports into Tanganyika Territory of 101,354 Japanese electric lamps valued at £118. Total imports of radio apparatus (Zanzibar excluded) show a further increase though not so large as in 1935. The total value in 1936 was £29,855 (against £24,733 in 1935), of which the United States supplied apparatus to the value of £16,250, the United Kingdom's share being £7,110. The relatively low price of American receiving sets designed for long-distance reception and the stimulation of interest in broadcasting because of its utility value as a world news medium as well as its appeal as entertainment, has resulted in largely increased sales of sets from the United States. Imports of radio apparatus by local Governments accounted for only £657 of the total figure for the United Kingdom. The value of imports of electrical machinery and parts (Zanzibar excluded) in 1936 was £47,812, as compared with £77,791 in 1935, the bulk of which (£37,302) was supplied from the United Kingdom. The marked decline in both total imports and imports from the United Kingdom is explained by the fact that the figures for 1935 were swollen by non-recurring imports of generating machinery for central power plants. Among the new manufacturing enterprises launched during the period under review was a modern electrically equipped tannery near Nakuru, in Kenya, which is capable of handling approximately 15 tons of leather monthly.

Orders Recently Booked

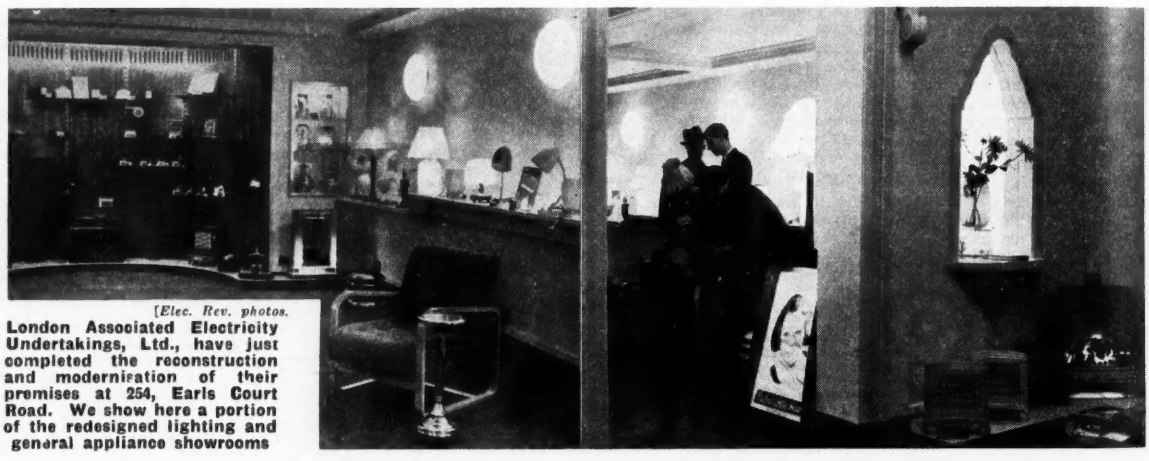
Among recent orders received by J. Browett Lindley (1931), Ltd., are a 250-kW "central valve" type steam engine driving an a.c. generator for Westcott's Laundries, Ltd., Chingford, and a similar engine of 125 kW for the Ermelo municipal power station, South Africa. Orders have also been received for two 2-stage motor-driven air compressors (with intercoolers), driven by 150-b.h.p. slip-ring induction motors for the L.N.E.R. Stratford works, each machine having a capacity of 750 cu. ft. per minute, and a single-stage motor-driven air compressor with air receiver, piping and air filter for the British Northrop Loom Co., Ltd., Blackburn, having a capacity of 800 cu. ft. per min.

Atozed (London), Ltd.

Owing to reorganisation and extensions of Atozed (Kingston), Ltd., a new company has been formed, to be known as Atozed (London), Ltd., to take over Atozed (Kingston), Ltd. Mr. J. A. Gould, managing director of Atozed (Kingston), Ltd., will be the managing director of Atozed (London), Ltd.; Mr. C. J. Stock has been appointed a director of the new company and Miss W. M. Clements the official secretary. For all trade purposes there will be no break in the continuity of the business.

Commercial Electrical Travellers

This year's annual dinner and dance of the Electrical Trades' Commercial Travellers' Association, which was held on November 19th at the Criterion Restaurant, was attended by 273 people, and the whole evening reflected great credit upon the organising committee, especially Mr. C. F. Tapster, the hon. secretary. Following the reception by the chairman, Mr. C. W. Boyce, and his wife, the company sat down to dinner, during which musical numbers were rendered by Jack Upson and his band, who also provided the music for the subsequent dancing. After the loyal toast by the chairman Mr. J. D. Reddy proposed the toast of the evening, "The Ladies." Mrs. C. F. Tapster, in responding, thanked the chairman on behalf of the ladies for the presents (a chromium calendar and chocolates). In proposing the toast of "The Chairman," reference was made by Mr. E. North of the nine years of valuable work by Mr. Boyce as hon. secretary of the Association, and also the assistance rendered by Mrs. Boyce during that period.



[*Elec. Rev.* photos.

London Associated Electricity Undertakings, Ltd., have just completed the reconstruction and modernisation of their premises at 254, Earls Court Road. We show here a portion of the redesigned lighting and general appliance showrooms

Next Year's B.I.F.

A record demand for 943,352 sq. ft. of space at the British Industries Fair is announced by the Department of Overseas Trade. Holland still leads the thirty countries from which buyers have already intimated their intention to visit the Fair. Belgium is second, closely followed by the Irish Free State, with France, Germany, Denmark and Norway next in order. Among the goods in which foreign buyers are chiefly interested, machinery (especially printing and electrical equipment) is conspicuous.

Prices of Materials

Henry Gardner & Co., Ltd., report, November 24th: Copper bars (best selected), sheet and rod, £75; £3 dec. English pig lead, £18; £1 10s. dec. Spelter, £14 17s. 6d.; £1 5s. dec. English block tin, £181; £7 dec.

Edward Till & Co. report, November 24th: India rubber, Para fine, 7⅛d.; ⅛d. dec.

Frederick Smith & Co. report, November 24th: Electrolytic copper bars, £43 10s., £2 10s. dec. Ditto, ditto, wire rods, £49, £2 10s. dec. Ditto, ditto, h.c. wire, 8d., ¼d. dec. Silicium bronze wire, 8¾d., ¼d. dec.

Lighting in America

The monthly luncheon of the Batti-Wallah's Society took place at the Hotel Victoria on November 23rd. Col. Sir T. F. Purves, president, occupied the chair. Mr. W. J. Jones

(E.L.M.A.) was the principal guest and spoke of his visit to the U.S.A., after a lapse of ten years. He had been impressed by the careful and thorough way in which illumination development work was done in America. Though this country might learn some things from America we were leading in some respects, especially with regard to street lighting and in co-operation between lighting engineers and architects.

But the Americans seemed to have a flair for commercial aspects. Well educated and well paid men were put in charge of Lighting Departments. Each looked after 1,000 "commercial" consumers, the more important ones being visited three or four times a year. Each man was expected to bring in 250 kW of load per year. About 1,800 "home advisers" were employed, all young women who visited consumers; each was expected to bring in an average of 150 kW of load yearly. Indirect illumination, which was not liked in this country, was favoured in shops and offices, but was now being modified by lighting the undersides of the indirect fittings. Intensities of over 30 ft.-candles were general, compared with, say, 5 ft.-candles in the British G.P.O. (it used to be less). Cheap-price stores used up to 60 ft.-candles, which created engineering problems; for not only had the light to be provided but the heat which the lamps generated had also to be extracted, and in some cases it was sufficient to warm two floors above the shop. An example of the bold experiments being tried in the U.S.A. was a chocolate manufactory which built a block of offices for 300 people without a single window. Uniform artificial illumination of 20 ft.-candles was provided throughout, together with conditioned air. In one school Mr. Jones visited light-meters were permanently fixed in 130 rooms to enable teachers to judge the correct amount of light to switch on. In a school for children with defective vision artificial light was automatically switched on as daylight waned. In America supplies of light-meters were available for loan to consumers.

The Hotel Exhibition

The Hotel, Restaurant and Catering Exhibition opens at Olympia, London, on Tuesday and will continue until December 8th. A description of the exhibits will appear in our next week's issue, together with details of other food preparation equipment available.

The Leeds Electrical Club

The ninth annual dinner of the Leeds Electrical Club was held last week at the Victory Hotel, Leeds, Lt.-Col. J. Campbell (vice-president) presiding owing to the unavoidable absence of the president. After the dinner the various trophies for golf, snooker, &c., were presented to the winners by Mrs. Campbell.

Left to right: Mr. and Mrs. R. Darnell, Mr. G. Mountain, Mrs. S. T. Needham, Lt.-Col. J. Campbell, Mrs. J. Campbell, Mr. S. T. Needham and Mrs. G. Mountain

New Catalogues and Lists

British Trane Co., Ltd., Vectair House, Newcastle Place, London, E.C.1.—A booklet concerning convection heating of buildings, illustrating a number of "Vectair" installations.

Franco-British Electrical Co., Ltd., 25/27, Oxford Street, London, W.1.—A 20-page catalogue of illuminated electric clocks and signs.

Lightfoot Refrigeration Co., Ltd., Bush House, Aldwych, London, W.C.2.—A complete illustrated catalogue of domestic electrical appliances.

Wardle Engineering Co., Ltd., Old Trafford, Manchester 16.—A 106-page illustrated catalogue of industrial lighting equipment and a booklet (46 pages) describing and illustrating "Maxheat" oval tubular heaters.

Mallinson and Eckersley, Ltd., Worsley Street, New Bailey Street, Salford, Manchester, 3.—A catalogue of "Blackfriars Ware" (various woods), including lamp standards and clocks.

Arora Co., Loughborough.—A folder illustrating electrical heating equipment for domestic purposes.

Ormond Engineering Co., Ltd., Rosebery Avenue, London, E.C.1.—A catalogue of electrical accessories, hair dryers and fans.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, London, E.C.1.—A leaflet illustrating l.v. overhead line accessories.

T. M. C.-Harwell (Sales), Ltd., 233, Shaftesbury Avenue, London, W.C.—A booklet describing and illustrating electrical accessories for domestic installations, and also table standards.

Bankruptcy Proceedings

V. M. Emerson, 35, Holloway Head, lately carrying on business at 59, Stratford Road, 166, Belgrave Road, and 332, Gooch Street, Birmingham, under the style of Emco Radio and Electrical Co., radio dealer, &c.—The public examination herein was held at the Court House, Corporation Street, Birmingham, recently. Debtor said that her husband had managed all her affairs, and, in effect, the businesses were his, carried on in her name. The statement of affairs showed a surplus of £79, but debtor admitted that there was some doubt as to the realisation value of a certain book debt. She added that on October 30th her husband went away and she had not seen him since. The examination was adjourned for closing.

G. L. Branford, radio and electrical engineer, 68, Margate Road, Ramsgate.—Public examination November 30th at the Guildhall, Canterbury.

A. E. Cowee, radio and electrical engineer, 113, Mount Pleasant Road, Tottenham, N.17.—Trustee, Mr. J. L. Poland, 29, Russell Square, W.C.1, Official Receiver, released November 4th.

E. James, radio engineer, Cusworth Lane, off York Road, Doncaster, formerly trading at Station Road, Askern.—Trustee, Mr. L. J. Clegg, 14, Figtree Lane, Sheffield, Official Receiver, released November 4th.

C. J. Tann, radio engineer, "Brianscot," Station Road, Wootton, I. of W., and formerly of Newport, I. of W.—Last day for receiving proofs for dividend November 30th. Trustee, Mr. A. L. Medcalf, 87, High Street, Portsmouth.

W. R. Paddon, radio dealer, Sea View Terrace, St. Ives, lately trading at Chapel Street, St. Ives, Cornwall.—First meeting November 26th at 12, Princes Street, Truro. Public examination January 14th at the Town Hall, Truro.

W. H. Secker (Modern Wireless Depot), wireless engineer, 93, Magdalen Street, Norwich.—Application for discharge to be heard on December 13th at the Shirehall, Norwich.

E. L. Spring, electrical and wireless dealer, 61, Dovecot Street, Stockton-on-Tees.—Discharge suspended for twelve months until October 26th, 1938.

Company Liquidations

Flockhart, Russell & Stubbs, Ltd., 114, Granby Street, Leicester, dealers in radio sets and electrical appliances.—The winding-up order against this company was made recently, and according to the statement of affairs returned there are gross liabilities of £13,972, of which £7,679 is expected to rank for dividend, against assets of £3,247. There is an estimated deficiency of £4,432. The company was incorporated on July 25th, 1936, with a nominal capital of £1,500, all of which was issued for cash. The company carried on business at Slade Road, Erdington, Birmingham; Maney Corner, Sutton Coldfield; Granby Street, Leicester, and Laxton Street, Leicester. The failure of the company is attributed by the directors to normal trade loss during the seasonal slack period (April to September, 1937), in the radio trade; bad debts incurred on hire-purchase transactions, which comprised 95 per cent. of the company's business; heavy overhead charges; and cost of expansion of sales force in readiness for the 1937-38 season.

Bonner's Radio, Ltd.—Winding up voluntarily. Liquidator, Mr. A. T. Eaves, 47, Mosley Street, Manchester. Particulars of claims to the liquidator by December 10th.

East Midland Electrical Co., Ltd.—Meeting December 17th at St. Rumbold Street, Lincoln, to receive an account of the winding-up by the liquidator, Mr. R. Archer.

Durham & District Electric Traction Co., Ltd.—Meeting December 20th, at 88, Kingsway, W.C.2, to receive an account of the winding-up by the liquidators, Messrs. T. Bower and H. G. W. Teverson.

Bowyer-Lowe & A.E.D., Ltd.—Winding up voluntarily. Liquidator, Mr. C. Hastings, 10, Prince Albert Street, Brighton. This notice is in compliance with the Companies Act, 1929, and all trade creditors have been or will be paid in full.

Melbourne Electric Supply Co., Ltd.—Winding up voluntarily. Liquidators, Sir Arthur Robinson, 360, Collins Street, Melbourne, Mr. J. S. Teulon, 242, Orrong Road, Toorak, Victoria, Mr. V. C. Latham Baillieu, 95, Gresham Street, London, E.C., and Mr. W. E. Lane, 27-28, Finsbury Square, London.

E. Marshall, Ltd.—Particulars of claims by December 7th to the liquidator, Mr. W. W. Hodgson, 35, Copthall Avenue, E.C.2.

Henry Holland & Co. (Signs), Ltd.—Meetings December 20th at 1, Cooper Street, Manchester, to receive an account of the winding-up by the liquidator, Mr. S. Garner.

Associated Electric Laboratories, Ltd.—Winding up voluntarily. Liquidator, Mr. G. R. Williams.

Meeting December 16th, at Stafford House, Norfolk Street, Strand, W.C.2, to receive an account of the winding-up by the liquidator, Mr. G. R. Williams.

Private Arrangement

W. H. Eccles, 10, Lake Place, Hoylake, late 66, Walker Street, Hoylake, electrical and radio dealer, &c.—At the meeting of the creditors the statement of affairs showed ranking liabilities of £403. After allowing £11 for preferential claims the net assets were £116, leaving a deficiency of £287. It was stated that up to October, 1936, the debtor was in employment and supplemented his earnings by carrying on business from his private residence. He then rented shop premises at Walker Street, Hoylake, being assisted in the business by his wife. In July last he disposed of the business at Walker Street for £150. Owing to pressing creditors a deed of assignment had already been executed to Mr. A. Myerson, I.A., Liverpool. A resolution was passed confirming the deed.

Dissolution of Partnership

G. E. Middleton & Co., automobile electrical engineers, 39, Milton Street, Hulme, Manchester, and 413, Stretford Road, Old Trafford, Manchester.—Messrs. J. Jewitt and G. E. Middleton have dissolved partnership. Mr. Middleton will attend to debts and carry on the business.

Electricity Supply

Lighting, Domestic, Power

Africa.—60-kV LINE ACROSS THE SAHARA.—In a recent issue of *La Technique Moderne* some particulars are given of the 60-kV three-phase transmission line which has been completed between Laghouat and Ghardaia, a distance of about 127 miles, across the Sahara desert. The erection of the line necessitated the transportation of over 2,700 tons of materials from Algiers, the first 70 miles by narrow-gauge railway and 200 miles by motor trucks. Despite these difficulties and the erection of 862 supporting masts, the line was erected in eight months.

Amble (Northumberland).—METER RENTS TO CEASE.—The Urban District Council has agreed to abolish electricity meter rents.

Ashton-under-Lyne.—NEW STREET LIGHTING.—" Wembley " lanterns and 500-W " Osram " lamps have recently been adopted for the lighting of several important thoroughfares. The lanterns are fitted with heavy-gauge copper bodies, external focusing and rotatable refractor plates. They also incorporate hinged vitreous-enamelled steel reflectors and heat-resisting clear globes. Generally, these are mounted on G.E.C. " Lewisham " steel poles with 7 ft. 6 in. projecting arms at a height of 25 ft. Where existing poles are used special extension pieces and brackets have been fitted to obtain the required mounting height and projection over the roadway. The average spacing varies from 120 to 150 ft., in staggered formation. Special relay control equipments have been installed in the bases of certain poles. These are operated from a master control board actuated by an " Osram " photo-electric cell housed in a feeder pillar. In all, ninety-seven new units have been installed in Katherine Street, Mossley Road and Beaufort Road by the Electricity Department.

Australia.—VICTORIA.—The State Electricity Commission announces that meter rents have been abolished in all areas from August 1st, and that reductions in commercial and industrial power and heating tariffs have been made at Ballarat and Bendigo. The concessions are estimated to save consumers £16,000 a year.

A new electrical laboratory is being constructed by the Commission at Yarraville to replace the present laboratory which is out of date and inadequate for the work to be performed. The new equipment will include e.h.v. testing apparatus, and the cost of the building alone will be £13,526.

Banstead.—STREET LIGHTING INAUGURATED.—Councillor B. D. Williams, chairman of the Urban District Council, last week inaugurated the Council's public lighting scheme at Banstead and Burgh Heath (573 lamps) by operating a switch in the London and Home Counties Joint Electricity Authority's sub-station at Burgh Wood. Mr. F. W. Purse, chief engineer of the J.E.A., said that the Council had made history that night. In no other installation were so many lamps controlled from one centre. A similar ceremony took place at the County of London Electric Supply Co.'s sub-station at Upper Pines, Woodmansterne, where Councillor E. Gale, chairman of the General Purposes Committee, switched on 199 lamps. The contracts with the J.E.A. and the County Co. are for ten years.

Barking.—HIRE CHARGES.—Arrangements have been made by the Electricity Committee for the weekly collection from Corporation and London County Council tenants of charges for the hire of apparatus on the basis of 1d. per week for each 1s. of the quarterly rental.

Bathavon.—REQUEST FOR ELECTRICAL INSTALLATIONS.—Tenants of houses at Keynsham recently wrote to the Rural District Council asking for the installation of electric lighting and expressing their willingness to pay the Council a weekly sum until the total cost had been met. The Plans and Housing Committee decided to refer the matter to the Keynsham Housing Sub-committee.

Bedford.—METER TESTING.—The Electricity Committee is to install meter-testing apparatus at a cost of £435.

EXTENSION.—Mains are to be extended in order to provide a supply to 46 houses on the Mile Road estate.

Bolton.—LIGHTING.—The Lighting Committee is proceeding with the erection of sodium electric-discharge lamps in Deane Road.

Bristol.—DOCK IMPROVEMENTS.—Centralised signalling is to be provided by the Docks Committee at the Avonmouth Docks at a cost of £8,500.

Burton-on-Trent.—The Electricity Committee is to extend its mains to Newhall at a cost of £1,500.

Canada.—BRITISH COLUMBIA.—The Vancouver correspondent of the *Financial Post* (Toronto) reports that engineers of the British Columbia Department of Lands have discovered a new source of hydro-electric power which may some day provide energy for west coast industries. It is stated that a method has been found of turning the Nechako watershed so that it will run westward to the sea. The Nechako programme would increase the potential water-power of the coast region of British Columbia to two million horse-power, and this is regarded as of particular importance in view of prospective large-scale pulp and paper developments in the area affected.

Colchester.—STREET LIGHTING.—At a recent meeting of the Lighting Committee the assistant borough electrical engineer was asked to report as to the comparative costs of schemes for carrying out improvements to street lighting.

Darlington.—DISCOUNT.—The Electricity Committee has decided to give consumers a 20 per cent. discount for the current quarter.

Darwen.—EXTENSION.—A scheme has been approved by the Electricity Committee for the extension of mains to Eccleshill, subject to the consent of Lancashire Electric Power Co. and the Blackburn Rural District Council.

Durham.—SUB-STATION.—The North-Eastern Electric Supply Co., Ltd., is to erect a sub-station on the Corporation housing estate in Sherburn Road.

Gainsborough.—DOMESTIC TARIFF CONCESSION.—The " unit " charge under the Electricity Department's " all-in " domestic tariff has been modified by the abolition of the charge of 1½d. per kWh for the first 40 kWh per quarter. All consumption is now charged at ½d. per kWh.

Gateshead.—SUPPLY EXTENSION.—The Town Council has received sanction to borrow £1,840 for supplying electricity to 244 houses on the Carr Hill estate.

London.—HAMMERSMITH.—The Works Committee recommends the installation of mercury electric-discharge lamps in Fulham Palace Road at a cost of £360. It is also proposed to improve the lighting in Waldo Road and thoroughfares north of it to the borough boundary by the provision of 200-W filament lamps in modern fittings, with smaller spacing and increased height. The cost is estimated at £620.

LOWER CHARGES.—London Associated Electricity Undertakings, Ltd., has issued a statement to consumers announcing reductions in charges to operate from the Christmas meter readings. Two main changes are a reduction in the domestic two-part tariff fixed charges averaging 50 per cent. (in some cases as much as 70 per cent.); and a reduction from ½d. to ¼d. in the running charge of the commercial two-part tariff, with a simpler method of assessing the fixed charge.

Manchester.—INCREASE IN COST OF FUEL.—It is announced that the higher price of coal for the 1938 tenders will mean an increase of £80,000 in the Electricity Department's bill. The Department had hoped to make reductions in the price of electricity to all consumers, but this is now unlikely. Since the Marketing Board took control of the output and sale of coal the pithead price of slack, as used by the Electricity Department, has advanced by 50 per cent. and in some cases even 75 per cent.

Margate.—STREET LIGHTING.—The Town Council has accepted the quotation of the Isle of Thanet Electricity Supply Co., Ltd., for the lighting of a part of Canterbury Road.

Newport (Mon).—OVERHEAD LINES INQUIRY.—A Ministry of Transport inquiry was held last week in connection with the proposed erection of overhead lines at Llanbadoc and near St. Mellons by the South Wales Electric Power Co. The Monmouthshire County Council asked for an undertaking that the poles would be set back well off the highway. For the company it was stated that it had been asked to give such an undertaking on thirty occasions since 1934, but that only in one case had road widening materialised. After hearing both sides the inspector visited the localities concerned.

Northern Ireland.—LARNE.—In response to petitions by residents for street lighting in Eden and Boneybefore quotations from the Carrickfergus Electricity Department were submitted at a recent meeting of the Larne Rural Council. It was agreed that the lamps should be provided.

North Wales.—SUPPORT FOR ASSOCIATION'S SCHEME.—The £6,000,000 scheme of the North Wales and South Cheshire Local Authorities' Electrical Undertakings' Association was discussed at Oswestry last week. Recommendations of the Lighting Committee were to the effect that while strongly in favour of retaining its electricity undertaking the Council should support the Association's scheme if legislation were passed requiring amalgamations, and expressing itself in favour of the principle of public ownership. Replying to the discussion, Alderman O. Jones explained that the local authorities' scheme had been prepared to counter the proposals of the North Wales Power Co., and said that it was not right that any private concern should have a monopoly control of a service such as electricity supply. An amendment referring back the initial recommendation was heavily defeated.

Pelton Fell (Co. Durham).—SUB-STATION.—The North-Eastern Electric Supply Co., Ltd., is to erect a sub-station in Whitehill Terrace.

Sheffield.—COST OF COAL.—Amplifying the report in our last issue referring to the decision of the Committee of Investigation into objections which were lodged by the Electricity Department, Mr. J. R. Struthers, general manager and engineer, gives the following figures, which show that the cost of coal supplied to the Department has increased by nearly 50 per cent. during the last three years: 1935 to 1936 contract (212,000 tons), average price per ton, 12s. 2.51d.; 1936 to 1937 contract (375,700 tons), average price per ton, 15s. 10.41d.; and 1937 to 1938 contract (419,000 tons), average price per ton, 17s. 8.34d.

Smallburgh.—RURAL SUPPLIES.—The Norwich Corporation having sent a letter stating that an electricity supply could not be afforded to the villages of Skeyton and Swanton Abbot,

the Rural District Council has decided to approach the Electricity Commissioners in the matter.

Taunton.—OVERHEAD LINES.—Application has been made to the Minister of Transport for consent to the erection of overhead lines at Bishop's Lydeard, Combe Florey, West Bagborough and Lydeard St. Lawrence.

Whitby.—SCHEME FOR EXTENSION TO LYTHE.—The North-Eastern Electric Supply Co., Ltd., is considering an electricity supply scheme for Lythe.

Worksop.—SHOP-WINDOW LIGHTING.—A Shopping Week (December 5th to 11th) is being organised by the Electricity Department and the local Chamber of Trade, and substantial concessions are to be made by the Electricity Department to all shopkeepers taking part. Two window-lighting competitions are being organised.

Traction

Gateshead.—ACQUISITION OF TRAMWAYS.—The Town Council has decided to promote a Parliamentary Bill to take over the existing tramway services in the town operated by the Gateshead and District Tramways Co., Ltd. One of the Bill's clauses will empower the Council to operate trolley-buses on the tram routes and any other routes.

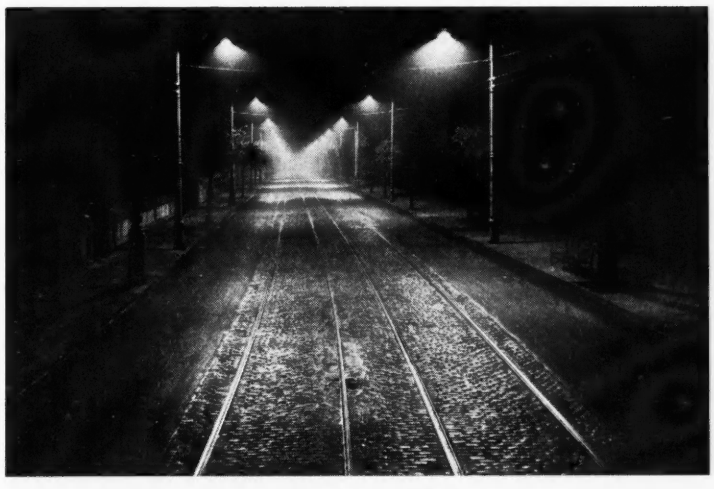
London.—REARRANGING THE METROPOLITAN LINE.—Fifteen hundred men are now working on the extension of the Bakerloo Line to Finchley Road and the reconstruction of the Metropolitan Railway. The boring of 2¼ miles of double tube tunnel between Baker Street and Finchley Road, under the Metropolitan tunnels, has just been completed, and now the southern ends of the new tubes will be connected with the existing Bakerloo tubes at Baker Street station. The junction at Finchley Road station with the Metropolitan tracks is a more complex undertaking. A new "up" tunnel is being built for Metropolitan trains. When the trains are transferred to this the tubes will be driven through the old "up" tunnel, rising to the surface at the station. Men have just begun to cut away part of the island platform at Finchley Road. When the work has been completed this station will be the key interchange station of the new system. All trains, Bakerloo and Metropolitan, will stop there. The fast tracks will be on the outside and the slow tracks on the inside, with two island platforms in between. A passenger will be able to arrive from the City by a Metropolitan train and change at Finchley Road into a Bakerloo train across the platform. There will be no subways and no need to use stairs or bridges. Farther down the line the construction of the fly-under which will enable trains to leave the Neasdon depôt without crossing other tracks has passed its most difficult stages. North of Wembley Park station good progress is being made with the fly-under junction which will carry trains to and from Stanmore. Work has just been begun on another key job, the reconstruction of the North Circular Road bridge. It is necessary that the bridge, now consisting of four arches, shall be carried over all the Board's lines in one span of 110 ft. Apart from the 2¼ miles of new tube tunnels, the construction of new tube stations at Acacia Road and Swiss Cottage and the modernising of Baker Street station, the scheme, which will cost about £7,000,000, includes the reconstruction or enlargement of fifteen stations, the rearrangement and resignalling of 28 miles of track, the widening of 8 miles of line between Harrow and Rickmansworth, the electrification of 10½ miles of lines between Rickmansworth, Amersham and Chesham and the rebuilding of the Neasden depôt. It is hoped to run the first Bakerloo train to Wembley Park and Stanmore about the middle of 1939.

ALTERING ALDGATE EAST STATION.—Early every Sunday morning a girder about 70 ft. long and weighing 30 tons is run into Aldgate East station and erected in position before traffic begins again four hours later. Twenty-one of these girders are being erected to carry the roof of the tunnel in one span instead of on columns. When the roof is supported by the girders the tunnel will be enlarged from 30 ft. to 70 ft. to carry four railway tracks instead of two. The work is part of the enlargement of the Aldgate East-Minories-Aldgate triangle to facilitate the running of eight-car trains. Including a new Aldgate East station, the work will cost £1,000,000. The erection of the girders was rehearsed for some weeks in the workshop before anything was attempted on the site. Two specially designed railway trucks, each with a platform carried on roller bearings, are used. The platforms are poised so delicately that in less than half an hour the two

Irish Street Lighting Experiment

WITH the object of demonstrating what can be accomplished in the way of improved public lighting, the Irish Free State Electricity Supply Board has installed a new system along about a mile of Merrion Road, Dublin.

The lighting is designed specifically to meet all the traffic requirements of Merrion Road and of all similar main traffic routes into the city, and was evolved after a complete examination of all technical and financial considerations as well as the ultimate effect on users. The Board has endeavoured to cater for the lighting needs of all road users, recognising that each views the road from a different angle and with varying mental and physical reactions. It is not claimed that the lighting meets completely all requirements, but the Board believes that it will be regarded as a great improvement. An actual small diversity does exist, but it does not affect the visibility of the pedestrian, cyclist or motor driver along the road. It could be removed, but at the cost of introducing glare. The visibility is so good that motorists do not require to use their headlights.



New lighting at Merrion Road, Dublin

The average width of the road on this mile is 64 ft., with a carriageway of 38 ft. 6 in. and two pathways. The existing tram standards are utilised as lamp posts for all except two lamps. Brackets with a projection of 6 ft. are mounted on the tops of the standards above the span wires. Each is fitted with a four-way adjusting device which permits the vertical mounting of lanterns over the road surface irrespective of the setting of standards in the ground. The lanterns are mounted opposite each other across the roadway, and the average spacing along the road between each pair of posts is 121 ft., with an average height to light source of 25 ft. 6 in. Each lantern is fitted with a 300-W incandescent filament lamp.

The lanterns cut off all emission of light from the source within approximately 20 deg. of the horizontal plane. They are of simple design, comprising a well-ventilated canopy and body of sheet copper enclosing a single-piece silvered mirror dome reflector with refracting prisms on the outer, and silvered, surface of the glass. The inner, and exposed, surface of the reflector is smooth except for a raised focusing line. The lantern is open at the bottom and includes no glassware other than the reflector. Focusing is controlled by a single external thumbscrew, and the lamp filament can be moved not only in a vertical but also in a horizontal plane for correct positioning. All metal parts are non-ferrous, and construction is such that normal maintenance should not exceed the periodic washing of the inner smooth surface of the glass reflector and the replacement of lamps.

The illumination on the road surface averages 1.0 ft. candle under the lighting units and 0.35 ft. candle at the test point, giving a diversity in illumination of 2.8 to 1. The diversity of brightness is greater than the diversity of illumination, and is visible to the eye. The variations in brightness do not, however, seriously affect the "visibility" in the installation. More even brightness can be obtained by altering the focus of the lamps in the lanterns, but the introduction of more high-angle light in this way inevitably increases the brightness of the units and gives rise to complaint of glare. The installation ensures that any driver exercising ordinary care will observe an object of appreciable size which is on the roadway up to a quarter of a mile ahead in all normal weather conditions except fog. The lighting is by means of Holophane PBL reflector lanterns arranged for asymmetric distribution.

halves of the girder lie across the track, the ends together ready for bolting.

Newcastle-on-Tyne.—RAILWAY ELECTRIFICATION.—Tests are now being made by the L.N.E.R. on the live rail of the new electrified route between Newcastle and South Shields, a distance of nine miles. The train service will be started early next year. An experimental coach is being run over the route. The total cost of the scheme is £500,000.

TROLLEY-BUSES.—The City Council is applying to the Ministry of Transport for consent to operate trolley-buses on another sixteen routes in the area.

New Zealand.—AUCKLAND.—Electric trams and motor buses in Auckland are operated by the Auckland Transport Board, of which Mr. A. E. Ford is manager. The tram tracks cover 44 route-miles, or 87 single-track miles, and the rolling stock comprises 221 cars, of which 183 are 52-seater bogie cars. For the year ended March 31st last, according to the *Electrical Engineer and Merchandiser*, the car mileage was 6,082,581 and the passengers carried numbered 50,396,190, as compared with 5,927,400 and 47,299,120, respectively, in the previous year.

Communications

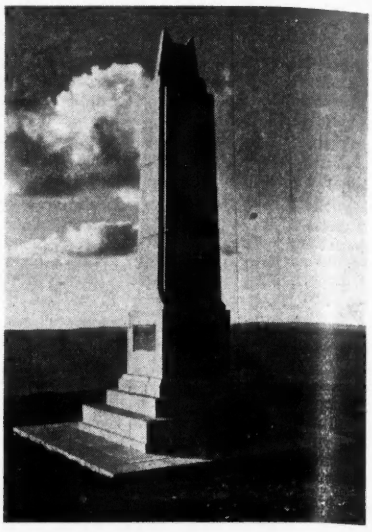
Australia.—BROADCASTING.—A new National broadcasting station, with a call signal of 6PH, is to be constructed on the top of the General Post Office building in Perth, according to the *Electrical Engineer and Merchandiser*.

TELEPHONY.—Plans and estimates are being prepared by the Commonwealth Postmaster-General's Department for the provision of a telephone service to Darwin, N.A. It is probable that a telephone circuit will be constructed alongside the overland telegraph line between North and South Australia, providing services for Alice Springs, Tennant's Creek and other centres *en route*.

Azores.—RADIO-TELEPHONE COMMUNICATION.—A radio-telephone service has recently been inaugurated between Lisbon and the Azores.

Great Britain.—RADIO LICENCES.—At the end of October the number of radio licences in force was 8,372,000, representing an increase of nearly 519,000 during the preceding twelve months.

POLDHU MEMORIAL UNVEILED.—On Monday afternoon the granite column erected by the Marconi Co. to commemorate the site of the former Poldhu wireless station was inaugurated on the cliffs at Poldhu Cove, in Cornwall. Plaques affixed to the sides of the monument were unveiled by the former chief engineer of the Marconi Co., Mr. R. N. Vyvyan, supported by other veteran engineers who were directly or indirectly connected with the work done at Poldhu between 1900 and 1902. Mr. H. A. White, chairman of the company, who presided, said that it was a source of distress to Marconi that other inventors working under the auspices of the company which bears his name did not always receive adequate recognition of their important contributions to the development of radio-telegraphy and radio-telephony. They were, therefore, happy to feel that in giving prominence to the names of John Ambrose Fleming and Charles Samuel Franklin they were carrying out wishes expressed by Marconi. The Poldhu station, from which the first wireless signals were sent across the Atlantic, was, in fact, designed by Fleming.



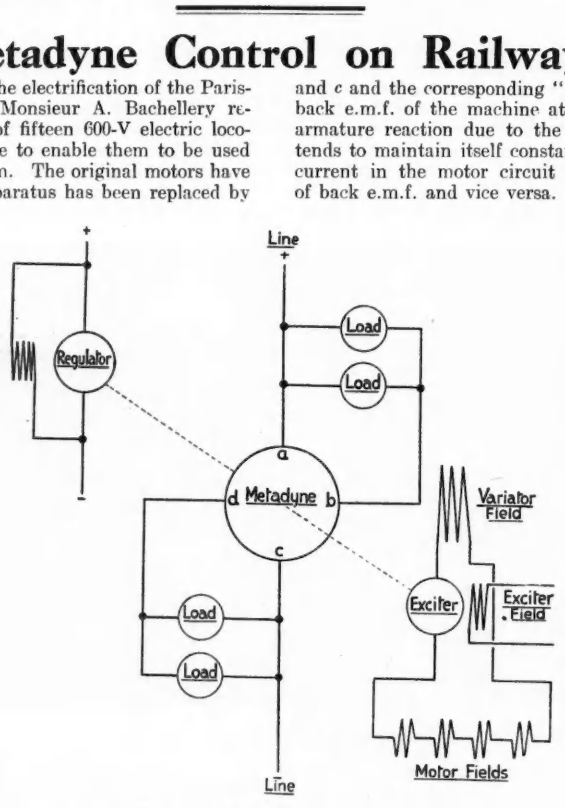
The Poldhu monument

United States.—A.T. & T. REPORT.—For the year ended August 31st last the gross operating revenue of the American Telephone and Telegraph Co. and its principal subsidiaries was $1,037 million, against $969 million in the preceding twelve months, an increase of $68 million. After meeting all expenses and charges there was a net profit of over $196 million, against $165 million in 1935-36.

Metadyne Control on Railways

IN his I.E.E. paper describing the electrification of the Paris-Orleans and Midi Railways Monsieur A. Bachellery referred to the reconditioning of fifteen 600-V electric locomotives built for suburban service to enable them to be used for shunting on the 1,500-V system. The original motors have been retained but the control apparatus has been replaced by a convertor group operating on the Metadyne system.

This device (due to Mr. J. M. Pestarini) transforms the constant line voltage to variable voltage, so as to give any speed-torque characteristic to the motors from standstill to full speed that the driver may desire, and *vice versa*. This it does by automatically giving a variable boost to the motor back e.m.f. that balances the line volts and overcomes the i.r. drop of the machines. The Metadyne thus takes the place of the starting resistances, accelerating relays, switches, and cam groups of the usual train control equipment and in addition provides means for smooth regenerative control of the machine to a standstill.



Simplified diagram of Metadyne system

A Metadyne set comprises three commutator machines on a common shaft. These machines are: (*a*) a regulator (a shunt-wound machine) which starts the set and keeps it running at fixed speed; (*b*) the Metadyne proper, consisting of an ordinary armature with commutator and a stator with four main poles and four brush arms; (*c*) an exciter for supplying the Metadyne "variator winding" and the fields of the traction motors.

A constant voltage supply is fed to the "primary" brushes *a* and *c* in the diagram, and the load is connected between *a* and *c* and the corresponding "secondary" brush *b* or *d*. The back e.m.f. of the machine at brushes *a* and *c*, produced by armature reaction due to the current in the motor circuits, tends to maintain itself constant, any tendency to increase of current in the motor circuit producing a checking increase of back e.m.f. and vice versa. A stable condition is thus produced, in which the motor load current is maintained constant irrespective of the motor speeds.

The variator winding controls the motor current by superimposing on the axis of armature reaction a separately excited flux, subtracting from the effect of armature reaction, so that more current is drawn from the line and the current in the motor circuits is increased. By control of the exciter field any characteristic can be given to the motors.

In regeneration, in order to avoid excessive voltage on the Metadyne brushes the motor armatures are connected across the brushes *a*—*d* and *b*—*c*. In this case the motors act as generators but here again, since the back e.m.f. tends to maintain itself constant, the currents in the motor circuits remain substantially constant unless modified by the variator winding. The current delivered to the line gradually diminishes as the train speed falls, until at low speeds and standstill the braking effort is maintained by current drawn from the line.

British rights for the Metadyne are held by the Metropolitan-Vickers Electrical Co., Ltd., which is supplying multiple-unit equipment to the order of the London Passenger Transport Board.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberystwyth.—December 21st. Electricity Department. E.h.v. and l.v. underground cables, distribution pillars and disconnecting boxes. (See this issue.)

Ashford (KENT).—December 6th. U.D.C. Electricity Department. Kiosk and one 100-kVA transformer. (See this issue.)

Australia.—MELBOURNE.—December 14th. State Electricity Commission of Victoria. Five three-phase, totally enclosed, oil-immersed, self-cooled reactors. (T.Y. 27849/37.)*
December 7th. Instrument transformers. (T. 27958/37.)*
December 21st. 22,000-V switchgear and accessories. (T.Y. 28275/37.)*

Ayr.—November 29th. County Council. Electrical work at police stations at Dalmellington, Symington and Skelmorlie. County architect, County Buildings.

Banff.—December 1st. County Council. Electric lighting at Portsoy Hospital extensions. County architect, Cullen.

Birmingham.—November 29th. Electric Supply Department. Meters. (November 19th.)

Bridlington.—December 4th. Town Council. 11-kV ring-main switchgear equipment, l.v. a.c. distribution panel and one 300-kVA and one 200-kVA transformers. (November 19th.)

Bristol.—December 9th. Corporation. 11-kV iron-clad compound-filled draw-out type e.h.v. switchgear and sheet steel, cubicle type l.v. sub-station switchgear. (November 19th.)

Bromley (KENT).—December 11th. Borough Council. 12-cwt. electric vehicle. (See this issue.)

Cudworth (YORKS).—December 8th. Education Committee. Electric lighting at Council school. G. J. Gibbs, Education Office.

East Grinstead.—December 1st. U.D.C. Twelve months' supply of electric cookers, water storage heaters, immersion heaters and circulators. (November 19th.)

Edinburgh.—December 17th. Commissioners of H.M. Office of Works. Domestic engineering service at new Government Offices, Calton site. Engineer, H.M. Office of Works, 122, George Street (deposit £1 1s.).

Erith.—December 7th. U.D.C. Electricity Department. Switchgear, transformers and metering equipment. (November 19th.)

Flaxton.—December 1st. R.D.C. Duplicate pumping unit, comprising electric motor, centrifugal pump and automatic control switchgear, at the Raweliffe Lane, Clifton Without, pumping station. L. Parker, surveyor, 10, Museum Street, York.

Galashiels.—December 3rd. Town Council. Electrical work at houses at Magdala Terrace. J. and J. Hall, architects.

Glasgow.—December 2nd. Corporation. Electrical installation at seventy-eight houses and four shops on the Provanmill housing estate. Town Clerk's Office (Room 36).

Hastings.—December 2nd. Borough Council. One year's supply of poles, stay blocks, transformers, galvanised steelwork, bolts, &c., for overhead lines. (November 12th.)

Holmfirth (YORKSHIRE).—November 29th. U.D.C. Electrically driven booster pumping set, in duplicate, for 6,000-gal. per hr., against a head of 115 to 185 ft., with all switchgear and accessories. S. G. Dilmot, clerk, Council Offices (deposit £3).

India.—MADRAS.—December 22nd. Electricity Department. Equipment in connection with the change-over of the Pykara-Coimbatore section of the Pykara hydro-electric development scheme from 66-kV to 110-kV operation. (T. 28193/37.)*

Inverlochy (FORT WILLIAM).—November 29th. Inverlochy Society, Ltd. Electrical work in connection with 150 houses. Resident architect, Estate Office, Inverlochy Village (deposit £1 1s.).

Kirkcaldy.—December 13th. Corporation. Electrical work at sixteen houses. Burgh surveyor.

Leeds.—December 8th. Baths and Property Committee. Heating the contents of Roundhay Park open-air pool by electricity or, alternatively, by gas. J. E. Acfield, city engineer, Civic Hall (deposit £3 3s.).

Liverpool.—December 7th. Corporation. Eighteen 750-kVA transformers for static sub-stations. (See this issue.)

Lochgilphead (ARGYLL).—November 30th. Argyll and Bute District Mental Hospital. Alterations to existing electrical installations at the Hospital. J. Campbell Murray, consulting engineer, 122, Wellington Street, Glasgow, C.2 (deposit £1 1s.).

London.—METROPOLITAN WATER BOARD.—December 30th. Three d.c. switchboards at the Hampton pumping station. Chief engineer, Room 235, 173, Rosebery Avenue, E.C.1 (deposit £2 2s. to the comptroller to the Board).
ISLINGTON.—December 28th. Borough Council. Meter testing instruments. (See this issue.)

Manchester.—December 2nd. Education Committee. Electrical installation at the Moston Fields Municipal school, Moston. Surveyor's Department, Education Offices, Deansgate.

Middlesex.—December 13th. County Council. Installation of electric lighting and power, &c., at the Redhill County Hospital, Edgware. (November 19th.)
December 16th. Electrical installation at the new senior elementary school, Wilmer Way, Southgate. (November 19th.)
December 23rd. Electrical installation at the elementary school, Kenmore Park Estate, Kenton. (See this issue.)

Mid-Southern Utility Co.—December 10th. H.v. and l.v. p.i. cables. (See this issue.)

Milford Haven.—December 7th. U.D.C. Electricity Department. D.c. and a.c. meter testing equipment and instruments. (See this issue.)

New Zealand.—WELLINGTON.—December 1st. Stores Control Board. Two steam engine- or turbine-driven alternators, switchgear, electric motors and one motor-driven centrifugal pump. (T.Y. 20412/37.)*
January 11th. Public Works Department. Ten sets of outdoor-type enclosed switchgear. (T.Y. 27781/37.)*
January 25th. 500 galvanised steel transmission line towers. (T.Y. 20857/37.)*
February 1st. Seven 1,000-kVA, oil-immersed, self-cooled, single-phase, outdoor type transformers and accessories. (T. 28018/37.)* (T. 28019/37.)*
160 galvanised steel transmission line towers. (T.Y. 28597/37.)*
February 8th. 20,000-kVA transformer banks. (T.Y. 28531/37.)*
January 25th. Post and Telegraph Department. Single conductor cable. (T. 28259/37.)*
CHRISTCHURCH.—December 7th. Electricity Department. Two three-phase automatic voltage regulators. (T.Y. 20936/37.)*

Northern Ireland.—BELFAST.—December 13th. Town Council. Electrically operated axial-flow type storm pumps, two to deliver 30,000 gal. per minute and two 20,000 gal. per minute of unscreened sewage; one auxiliary sump drainage pump, switchgear, overhead travelling crane, and associated works. City Surveyor's Department, Drainage Section (Room 90), City Hall (deposit £1 1s.).
December 10th. Electricity Committee. Electrically driven centrifugal sewage pump and pipework for the Harbour power station; steel hatchway covers at the Harbour station; and steel and concrete poles for street lighting. (See this issue.)

Poole.—December 8th. Waterworks Department. One electrically driven centrifugal booster pump and alteration to one centrifugal pump. G. V. Sparrow, waterworks engineer, Municipal Buildings (deposit £2 2s.).

Sheffield.—December 8th. Electricity Committee. Three water tube h.p. steam boilers, with all associated equipment. (November 12th.)

Sheppey.—December 8th. R.D.C. Electrically driven borehole pumping plant, 3,000 gal. per hr. capacity, at the Warden Point waterworks. E. F. Brading, surveyor, 395, Minster Road (deposit £2 2s.).

Sleaford.—November 29th. U.D.C. Electricity Department. Twelve months' supply of l.v. p.i. cables and a.c. and d.c. meters (November 12th.)

South Africa.—DURBAN.—December 10th. City Electrical Engineer's Department. 6,600-V switchgear. (T.Y. 28179/37.)*
BRITSTOWN.—December 20th. Municipality. Plant, equipment and materials required for inaugurating an electricity supply undertaking. (T. 27792/37)*
PRETORIA.—December 9th. Public Works Department. Electrically driven laundry machinery. (T.Y. 27797/37.)*
December 23rd. One 150-kVA. three-phase transformer, one h.v. and one l.v. switch and underground cable. (T.Y. 28446/37.)* L.v. switches and transformer. (T.Y. 28447/37.)*
December 23rd. Union Tenders and Supplies Board. Power equipment for the Bloemfontein carrier repeater station. (T. 28451/37.)*
HANOVER (CAPE PROVINCE).—December 1st. Municipality. Plant equipment and materials required for inaugurating an electricity undertaking. (T. 28177/37.)*
RICHMOND (CAPE PROVINCE).—January 10th. Municipality. Plant, equipment and materials for power station and distribution network. (T.Y. 28556/37.)*

Southport.—December 13th. Town Council. Water heating installation for electric lighting, power, telephones, clocks and special fire station equipment, &c. (See this issue.)

Stranraer.—December 9th. Town Council. Electrical fittings. Burgh surveyor.

Sunderland.—Town Council. Installation of electric lighting at the new domestic science centre and gymnasium, St. George's Square. Town clerk.

Uruguay.—MONTEVIDEO.—December 20th. State Electricity Supply and Telephones Administration. Electrical materials, including insulators, cut-outs, fuses, switches, lampholders, &c. (T.Y. 27631/37.)*

West Ham.—November 29th. Town Council. Traffic control signals at the junction of Beckton Road, Prince Regent Lane and East Ham and Barking by-pass, Canning Town, E.16. W. L. Jenkins, borough engineer, Town Hall, E.15 (deposit £1).

West Riding.—November 29th. County Council. Electric lighting at Batley Boys' Grammar school, Mexborough Secondary school and Wombwell Senior Council school. Education officer, County Hall, Wakefield.

Wetherby.—December 7th. R.D.C. Pumping plant consisting of single-phase electric motor and centrifugal borehole pump, at the proposed pumping station, near Long Marston. F. J. Rodwell & Son, consulting engineers, Prudential Buildings, 20, Park Row, Leeds (deposit £1 1s.).

Willenhall.—November 27th. U.D.C. One vertical electrically driven centrifugal pumping set for raising crude sewage. G. A. Waite, Council Offices.

---

* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Belford.—R.D.C. Accepted. Electrical works in connection with new houses (£290).—T. Sloan.

Gloucester.—Town Council. Accepted. Electricity meters. Aron Electricity Meter, Ltd. P.i. cables.—B. I. Cables; Edison Swan Cables.

Leeds.—Electricity Committee. Recommended. Additional switchgear at Kirkstall power station (£14,331).—Ferguson, Pailin.

London.—HAMMERSMITH.—Electricity Committee. Recommended. Repairs to storage battery at the electricity works (£327).—Pritchett & Gold and E.P.S. Co. 100 2,200-V single-phase, metal-clad switches (£71 7s. 2d. per switch).—Ferguson Pailin.

South Kesteven (DEEPING ST. JAMES).—R.D.C. Accepted. Electrically driven horizontal type centrifugal pump to deliver sixty gallons per minute (£165).—Hayward-Tyler & Co.

West Hartlepool.—Town Council. Accepted. H.v. distribution equipment.—Ferranti, Ltd.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, December 2nd. Institution, London, W.C.2. 6 p.m. "Rural Electrification." Mr. J. S. Pickles.

South Midland Centre.—Friday, November 26th. Grand Hotel, Birmingham. 6.30 for 7 p.m. Annual dinner. Monday, November 29th. James Watt Memorial Institute, Birmingham. 7 p.m. "Modern Systems of Multi-Channel Telephony on Cables." Col. A. S. Angwin and Mr. R. A. Mack.

Tees-side Sub-Centre.—Friday, November 26th. Linthorpe Assembly Rooms, Middlesbrough. Annual dance. Wednesday, December 1st. Cleveland Technical Institute, Middlesbrough. 6.45 p.m. "Safeguards Against Interruptions of Supply." Messrs. H. W. Clothier, B. H. Leeson, and H. Leyburn.

Western Centre.—Friday, November 26th. 4 p.m. Visit to the Cardiff Engineering Exhibition. Monday, November 29th. 7 p.m. Plymouth Technical College, Plymouth. Paper by Messrs. Clothier, Leeson and Leyburn. (See above.)

North Western Centre.—Tuesday, November 30th. Engineers' Club, Manchester. 7.15 p.m. "Street Traffic Signals." Mr. F. G. Tyack.

Wireless Section.—Wednesday, December 1st. Institution, London, W.C.2. 6 p.m. "Some Aspects of Magnetic Recording and its Application to Broadcasting." Messrs. A. E. Barrett and C. J. F. Tweed.

Institute of Marine Engineers.—Friday, November 26th. Grosvenor House, London, W.1. 7.15 p.m. Annual conversazione.

Electrical Power Engineers' Association *(London Technical Group).*—Tuesday, November 30th. Caxton Hall, London. S.W.1. 7.15 p.m. "The Double Rotation Turbine." Mr. P. J. Wakefield.

South Coast Section.—Saturday, November 27th. Kimbell's Café, Southsea. 2.30 p.m. Annual meeting. 6.30 p.m. Annual dinner and dance.

Institution of Civil Engineers.—Tuesday, November 30th. Institution, London. S.W.1. 6 p.m. "The Design and Operation of the Coleshill Sewage Disposal Works of the Birmingham Tame and Rea District Drainage Board." Mr. F. C. Vokes.

Institution of Heating and Ventilating Engineers.—Wednesday, December 1st. Institution of Mechanical Engineers, London, S.W.1. 7 p.m. Joint meeting with the Institute of Fuel. (See above).

Notes

High-voltage Cable in Holland

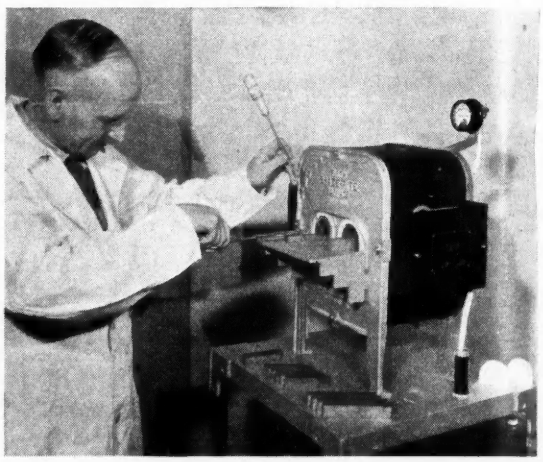
When the Dutch testing organisation, K.E.M.A., in 1934 planned a series of tests on lengths of cable to run at 150 kV, W. T. Henley's Telegraph Works Co., Ltd., obtained permission to co-operate, and for the past three years has been in close touch with that body trying different designs of cable, joints and terminals for this voltage in the Dutch field laboratory. A length of gas-cushion cable has been, since last February, on a continuous load and over-voltage test, equivalent to 260 kV, three-phase, the run amounting to a total of over 7,000 hours and 300 heat cycles. The construction of the gas-cushion cable is similar to that of the normal mass-impregnated type, except that provision is made for the supply at points along the length of cable of gas at a pressure of several atmospheres to withstand which the lead sheath is reinforced externally. The effect of the pressure is to raise the dielectric strength of the cable very considerably, so that it can operate for indefinite periods at voltages which would cause rapid deterioration at atmospheric pressure. Preliminary trials extended as far back as 1934, and for the greater part of the time Henley's was the only British concern represented. Remarkably uniform power-factor/voltage curve, indicating an absence of ionisation, is being consistently maintained even at the highest voltages.

The I.E.E. in Liverpool

At the annual dinner of the Institution of Electrical Engineers, Mersey and North Wales (Liverpool) Centre, held in Liverpool on Monday, Mr. G. K. Paton (chairman of the Centre) presided over a gathering of about 200. Responding to the toast of "The Institution of Electrical Engineers" which had been proposed by the Lord Mayor of Liverpool (Alderman M. Cory Dixon), Sir George Lee (president I.E.E.) expressed the view that the present basis of education of electrical engineers was not broad enough and therefore they were often unable to put their views convincingly before those in authority. He advocated more cultural training. The present system was too much dominated by examinations, but so far an alternative solution had not offered itself. A large percentage of papers submitted to the I.E.E. was produced in the provinces but read for the first time in London, probably for reasons of prestige. The centres should try, however, to build up their own prestige so that it became comparable to that of the main centre of the I.E.E. Mr. O. C. Waygood proposed "The Guests" and pleaded for closer co-operation between the architect and the electrical engineer. Mr. Arthur Hewitt, for fifteen years chairman, North Wales and South Cheshire Joint Electricity Authority, believed that the J.E.A. was doomed, although the manner of that death was not yet apparent. The final toast of the evening was proposed by Mr. F. E. Spencer and acknowledged by the chairman.

Brazing Sintered Carbide Tools

An electric furnace for brazing carbide blanks to tools used for machining operations has been developed in the United States for working on either 110- or 220-V a.c. or d.c. circuits. After the shank and the sintered carbide blank have been ground down to a true metal-to-metal contact the former is inserted into one of the open muffles where it attains a temperature of 1,500 deg. F. It is then taken out far enough to permit the carbide blank with a suitable amount of copper to be put into place. Upon placing the tool back in the furnace the copper melts at about 2,050 deg. F. When the operator sees that this has occurred he withdraws the tool again and by means of a pressing tool squeezes out excess flux and copper to give good contact between the shank and blank. After the tool is cooled it is ready for application in its machine with very little preparatory grinding.



This electrically operated furnace has been developed for brazing sintered carbide blanks to tools

The E.I.B.A. Ball

The ball in aid of the Electrical Industries Benevolent Association at Grosvenor House, Park Lane, W., on Tuesday last, attracted a distinguished company. Mr. Frank Parkinson, the President of the Association, was present as were many other well-known electrical men. There was a total of about 950 people. During the evening a telegram of greeting was received from His Majesty The King (patron of the Association) and also a cablegram from Mr. E. E. Sharp (the chairman) who is abroad. It was announced that the income so far this year has exceeded that for the whole of last year. The programme receipts amounted to over £100.

Appointments Vacant

Lecturer in electrical engineering, &c., at the Forest of Dean Mining and Technical School.

Deputy municipal electrical engineer for Singapore.

Shift engineer for Manchester Electricity Department.

Senior technical assistant for Edinburgh Electricity Department.

Engineering assistant for the Metropolitan Water Board.

(See our classified advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

BRODER vacuum cleaner.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. H. J. Wright, M.Eng., A.M.I.E.E., A.M.I.Mech.E., has resigned his appointment with the Dundee Corporation Electricity Department to take up the position of engineer and assistant manager of the Karachi Electric Supply Corporation, Ltd. An honours graduate of Liverpool University, Mr. Wright received his works training with the British Thomson-Houston Co. and in the transformer, switchgear and cable shops of Johnson & Phillips, Ltd. Following a period as a transformer designer, he specialised in transmission and distribution work, eventually taking a leading part in connection with the designs and tenders for many important electrification contracts executed by Johnson & Phillips. He later had experience as a superintending engineer on outside contract work and took charge of the construction of the secondary grid lines in Somerset for the latter company before being appointed engineer and manager of the Dunoon and District Electricity Supply, Ltd. Mr. Wright sails in the s.s. *Carthage* on December 17th.

Mr. W. B. Williams, past-president of the E.C.A., has sent us a letter which he has received from Mr. N. D. B. Phillips, of Vancouver, British Columbia, who read our note on Mr. Williams's wedding jubilee. He says that he celebrated the 25th anniversary of his wedding in August. Mr. Phillips, who has an electrical importing and sales business in Vancouver, where he has been for the last fifteen years, recalls that he was an apprentice with Mr. Williams at the works of King, Mendham, Bristol.

Councillor J. Mayo, of J. Mayo & Co., electrical contractors, has been appointed Deputy Mayor of Tynemouth. At the November election he was returned unopposed, and has again been elected chairman of the Electricity Committee.

The Securities and Exchange Commission at Washington reports (according to the New York correspondent of the *Financial Times*) that the salaries paid to the chairman of the General Electric Co. (**Mr. Owen D. Young**) and the president (**Mr. Gerard Swope**) in 1936 were $146,000 each.

Mr. C. G. V. Rudd, M.Sc., B.E., A.M.I.E.E., of Crompton Parkinson, Ltd., is leaving England to join United Engineers, Ltd., the company's agents in Malaya. Mr. Rudd's activities with Crompton Parkinson since 1934 have been in the Manchester, Midlands and London areas as switchgear and industrial plant engineer. Prior to this he was with the New Zealand agents, Messrs. A. & T. Burt, and also successively with the staff, University of New Zealand, Auckland Electrical Power Board and New Zealand Broadcasting Board.

Mr. C. G. V. Rudd

Mr. J. D. Francis, chief commercial assistant with the Walton and Weybridge Electricity Department, has been appointed acting manager of the undertaking. The Council has decided that owing to the uncertainty regarding the future of the undertaking, which may be lost to the Council under Government proposals, it is inexpedient at the present juncture to appoint an electrical engineer and manager in succession to the late Mr. E. A. Anderson.

Mr. G. A. Vowles, borough electrical engineer and manager at Halifax, has accepted an invitation to become a member of the Consultative Technical Committee for the Mid-East England Area.

Mr. W. Weekes, A.M.I.E.E., who recently retired from the position of borough electrical engineer to the Shoreditch Borough Council, was entertained to dinner on November 18th at the Finsbury Central Club, City Road, E.C., when he was presented with a silver salver inscribed and bearing facsimile signatures of all those present. Not only did Mr. Weekes have the pleasure of meeting all the principal officials of the Council with whom he has worked for so many years, but the Council itself was represented by six of its members, among whom were the present chairman and two past-chairmen of the Electricity Committee. The company also included two old comrades who served with Mr. Weekes in the South African War with Lord Dunraven's Sharpshooters and two who served with him in the European war with the Middlesex Yeomanry.

Mr. C. H. Jones, who has for some years been assistant manager at the Blackpool branch of the General Electric Co., Ltd., has been appointed manager in succession to the late Mr. W. H. Coles. Mr. Jones joined the G.E.C. in 1914, and after service in France during the war he rejoined the staff of the Manchester branch of the company until his transfer to the Blackpool branch when it was opened in 1929.

Mr. R. Borlase Matthews has been elected a member of the Council of the Royal Agricultural Society of England for the next three-year period as the representative for Surrey.

Obituary

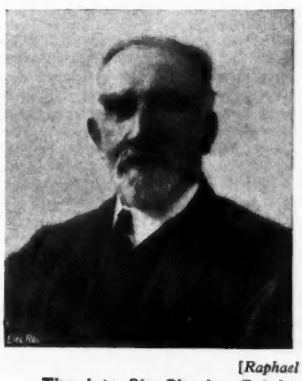
Mr. H. N. Whitford.—We regret to announce the death of Mr. Harry Norman Whitford, of the General Electric Co., Ltd., which occurred suddenly at his home at Hampstead on November 17th, in his fifty-fifth year. Mr. Whitford joined the G.E.C. in 1916, and after a brief period of service on the accounts and secretarial side of the business he was appointed personal assistant to Mr. M. J. Railing. The marked ability which he displayed in this capacity led to his appointment in 1925 to the post of commercial manager of Witton Engineering Works, where he carried out important work in the introduction of many forms of modern business systems rendered necessary by the rapid growth and development of the works. He took the keenest interest in the social and athletic side of life at Witton, being chairman of the management committee of the Magnet Club for many years. He also rendered great service to the work of the Electrical Industries Benevolent Association as vice-chairman of the Birmingham and District Advisory Committee.

The late Mr. H. N. Whitford

Sir Jagadis Chandra Bose.—By the death at Giridih, Bengal, on Tuesday, of Sir Jagadis Chandra Bose, F.R.S., D.Sc., at the age of 79, the scientific world has lost a research worker and an original experimentalist of a very high order, and an inspiring lecturer. His principal connection with electrical work was in the design of a type of coherer and of instruments for the study of electric waves, followed later by his investigations into the reaction of plants to electric stimuli, in connection with which he invented the "crescograph" which magnified small movements ten million times. After graduating at St. Xavier's College, Calcutta, and University College, London, Bose studied physics under Lord Rayleigh at Cambridge. He was later appointed to the chair of physical science at the Presidency College, Calcutta, from which he retired in 1915 as Emeritus Professor. Many universities in Great Britain and India paid him academic honours. He was awarded the C.I.E. and the C.S.I., and in 1917 received a knighthood. After his retirement he established the Bose Institution of Research in Calcutta, towards whch he contributed largely from his private means.

Sir Charles Bright.—We regret to record the death of Sir Charles Bright, F.R.S.E., M.Inst.C.E., M.I.E.E., &c., which occurred at his home at Little Brewers, Hatfield Heath, Bishop's Stortford, on Saturday last. Sir Charles, who was 73 years of age, was the youngest son of the late Sir Charles Tilston Bright, M.P., who was knighted at the early age of twenty-six years for the important part played by him in laying the first Atlantic cable.

The death of Sir Charles severs for submarine telegraph men, and for the ELECTRICAL REVIEW, which was so closely associated with them, another of the links with the early days of the Grays of Silvertown, and the great manufacturing and cable-owning companies which formed so large a section of the electrical industry. For many years he had been a great sufferer but even in his latest years he contrived at times to put in an attendance at meetings of the Institution, and about eighteen months ago, though severely handicapped by spinal trouble, he paid us what proved to be his last visit. To us, who had known him since his early



[*Raphael*

The late Sir Charles Bright

visits of 1891 and knew him, too, for his distinction as a tennis-player and oarsman, it was astonishing that one who had once been so active should be able to submit at last with such complacency to many years of most painful limitation. Though Sir Charles, after his education at Lancing and King's College, London, followed his father's profession of civil engineer and took part at one time in cable-laying expeditions, it is rather as an author that he will be remembered by the electrical reader. His more important works included "Submarine Telegraphs: Their History, Construction and Working"; "The Life of Sir Charles Bright"; "The Story of the Atlantic Cable"; and "Telegraphy, Aeronautics and the War." He made a report to the Colonial Office on the Pacific Cable scheme in 1897, and served on many Government and other committees dealing with cable matters, radio-telegraphy and aviation. For some years he was partner in consulting engineering practice in London

During his years of semi-retirement through illness, he was interested in many public movements, such as industrial co-partnership, industrial and international peace. He was elected a fellow of the Royal Society of Edinburgh in 1894 and was knighted in 1894. In 1899 he married Isabel, daughter of Mr. Robert Gosling, of Hassobury, Essex, and leaves a daughter; his only son died in 1925. Sir Charles was a very enthusiastic letter writer and his many correspondents will, we believe, wish to join with us in tendering our condolences to Lady Bright and her daughter in their bereavement. The funeral took place privately.

Mr. J. Crombie.—The death has occurred at Clarkston, near Glasgow, of Mr. James Crombie, who was formerly manager in Glasgow of the Eastern Telegraph Company and associated companies. Mr. Crombie, who was eighty-five years of age, retired from active participation in business a number of years ago.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Climax Water Heater and Circulator Co., Ltd.—Private company. Registered November 15th. Capital, £5,000. Objects: To carry on the business of manufacturers of and dealers in all kinds of appliances for the heating and circulating of water, &c. The permanent directors are: E. A. Franks. 5, Caegwyn Road, Whitchurch, Glam., and L. A. Watson, 10, Newport Road, Cardiff. Registered office: 24-5, Western Mail Chambers, St. Mary Street, Cardiff.

Thermostat Appliances, Ltd.—Private company. Registered November 15th. Capital, £200. Objects: To carry on the business of manufacturers of and wholesale and retail dealers in electrical fittings, plant, equipment, accessories, materials, apparatus and supplies of all kinds, and to carry on the business of electrical, hydraulic, heating and general engineers, &c. The directors are: J. B. Leigh, 119, Church Street, Blackpool, Engineer, and N. Douce, 654, Oldham Road, Failsworth, Manchester. Registered office: 37, Clifton Street, Blackpool, Lancs.

Thorne & Parry (1937), Ltd.—Private company. Registered November 15th. Capital, £300. Objects: To carry on the business of radio, television, and electrical dealers, engineers and agents, electricians, &c. The directors are: J. D. Parry, 36, Manor Rd., Manselton, Swansea, and A. J. Thorne, 7, Penfilia Terrace, Brynhyfryd, Swansea. Registered office: 83, Llangyfelach Road, Brynhyfryd.

Rice Engineering Co., Ltd.—Private company. Registered November 13th. Capital, £1,000. Objects: To carry on the business of general, mechanical, electrical, radio, motor, marine, constructional, ventilating and heating engineers, &c. The directors are: A. J. Rice, junr., 48, Lamberhurst Road, W. Norwood, S.E.27, and two others. Secretary: L. J. Burr. Registered office: 1, Station Chambers, High Street North, E.6.

Avis, Cook & Co., Ltd.—Private company. Registered November 13th. Capital, £5.000. Objects: To acquire the business of a gramophone and radio engineer carried on by A. V. Cook at 2/4, High Street, Ipswich. The directors are: A. V. Cook (permanent governing director), 86, Westbourne Road, Ipswich, and two others. Secretary: J. E. Braybrooke. Solicitors: Turner, Martin & Symes, 4/6, Elm Street, Ipswich.

Super Accumulator Co., Ltd.—Private company. Registered November 8th. Capital, £200. Objects: To carry on the business of manufacturers, importers and exporters of and dealers in batteries, accumulators and all classes of mechanical, electrical, and radio instruments, or any component parts thereof, &c. The directors are: A. M. Webb, 24, Killarney Road, S.W.18, and two others. Registered office: 702, Pagdon Street, Battersea, S.W.11.

Arbeid's Radio, Ltd.—Private company. Registered November 12th. Capital, £100. Objects: To carry on the business of dealers in and manufacturers of radio and television sets and apparatus, electrical and mechanical appliances, &c. The first directors are: A. Arbeid (permanent) and Mrs. R. Arbeid, both of 51, Castlewood Road, Stoke Newington, N.16. Registered office: 385, Mile End Road, Stepney, E.3.

Shields Radio Co., Ltd.—Private company. Registered November 18th. Capital, £2,500. Objects: To carry on the business of radio engineers and radio goods dealers, &c. The subscribers are: M. Gottlieb and Mrs. S. Gottlieb, both of 91, Ryhope Road, Sunderland. M. Gottlieb signs documents as director. Solicitors: Sebag Cohen & Co., 45/46, Sunniside, Sunderland.

F. J. Malpress, Ltd.—Private company. Registered November 20th. Capital, £1,500. Objects: To acquire the business of an electrical engineer, salesman and contractor carried on by F. J. Malpress at 48, Albion Street, Broadstairs, Kent. The directors are: F. J. Malpress (permanent), and Mrs. E. A. Malpress, both of "Bradstow," 44, Bradstow Way, Broadstairs. Secretary: E. H. Ovenden. Registered office: 48, Albion Street, Broadstairs.

Wheeler Wire Co., Ltd.—Private company. Registered November 20th. Capital, £20.000. Objects: To carry on the business of cable manufacturers, manufacturers of electric wires, electric, magnetic, galvanic and other apparatus, wire drawers, engineers, &c. The subscribers are: C. Oldroyd, 2, Eddercliff Crescent, Liversidge, and G. H. Oxley, 191, Old Bank Road, Dewsbury. Registered office: New Eastwood, Notts.

Returns of Electrical Companies

Concordia Electric Wire Co., Ltd.—Capital, £100.000 in £1 shares. Return dated August 20th, 1937. 57.319 shares taken up. £57.319 paid. Mortgages and charges: £8,000.

R. G. Poole, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated October 20th, 1937, to secure £100. Holder: R. B. Poole, 259, Bingley Road, Nab Wood, Shipley.

Conradty Products, Ltd.—Issue on November 1st, 1937, of £1,000 debentures, part of a series already registered.

Dowding & Mills, Ltd.—The nominal capital has been increased by the addition of £9.000 in £1 ordinary shares beyond the registered capital of £3,000.

Homelectric, Ltd.—Capital, £100 in £1 shares. Return dated July 28th, 1937. All shares taken up. £100 paid. Mortgages and charges nil.

Finnell System, Ltd.—Capital, £3,000 in £1 shares. Return dated October 30th, 1937. All shares taken up. £3,000 paid. Mortgages and charges: £905 16s. 1d.

Coates & Co. (Harrogate), Ltd.—Satisfaction to the extent of £250 on October 29th, 1937, of debentures authorised February 12th, 1937, and registered February 13th, 1937. (According to the register of mortgages the debentures registered February 13th, 1937, originally secured sums not exceeding £800.)

Electrical Power Engineering Co. (Birmingham), Ltd.—The nominal capital has been increased by the addition of £5.000 in £1 ordinary shares beyond the registered capital of £5,000.

Allen & Welsby, Ltd.—Capital, £1,500 in £1 shares. Return dated May 31st (filed September 23rd), 1937. 1,060 shares taken up. £1,060 paid. Mortgages and charges nil.

Power Flexible Tubing Co., Ltd.—The nominal capital has been increased by the addition of £4.000 in £1 ordinary shares beyond the registered capital of £17,000.

Brasse, Ltd.—H. A. Deed, of 97 and 99, Cheapside, E.C., ceased to act as receiver on November 11th, 1937.

E. C. and A. Ferguson, Ltd.—C. H. Bryant, of 65-66, Basinghall Street, E.C., was appointed receiver and/or manager on November 6th, 1937, under powers contained in debentures dated December 12th, 1932.

Wm. G. Walter (Bath), Ltd.—Further charge on Stuart Works, Stuart Road, Bath, dated November 5th, 1937, to secure £500. Holders: Bath, Somerset, Gloucester and Wilts Permanent Mutual Benefit Building Society, of 6, Pierrepont Street, Bath.

Reason Manufacturing Co., Ltd.—Satisfaction in full on October 20th, 1937, of charge registered February 6th, 1929. (According to the register of mortgages, the mortgage registered February 6th, 1929, originally secured all moneys due to bank.)

Bylock Electric, Ltd.—Satisfaction to the extent of £500 on October 31st, 1937, of debentures dated January 9th, 1936, and registered January 13th, 1936. (According to the register of mortgages, the debentures registered January 13th, 1936, originally secured sums not exceeding at any one time £4,500.)

Allen West and Co., Ltd.—Satisfaction in full on October 15th, 1937, of four debentures and one second debenture registered March 2nd, 1935, March 1st, 1928, April 14th, 1931, February 7th, 1934, and July 29th, 1935, securing £60,000, £40,000, £100,000, £60.000 and £40.000, respectively.

Electra (Birmingham, 1905), Ltd.—Capital, £500 in £1 shares. Return dated September 21st, 1937. All shares taken up. £500 paid. Mortgages and charges nil.

Express Radio Factors, Ltd.—Capital, £2,500 in £1 shares. Return dated September 17th, 1937. All shares taken up. £2,500 paid. Mortgages and charges nil.

British Electric Meters, Ltd.—Capital, £50 000 in £1 shares. Return dated August 4th (filed October 6th), 1937. 35,600 shares taken up. £28 250 paid. £7,350 considered as paid. Mortgages and charges nil.

Gardner & Co. (Portsmouth), Ltd.—Capital, £1.000 in £1 shares. Return dated December 31st, 1936 (filed September 20th, 1937). 902 shares taken up. £2 paid. £900 considered as paid. Mortgages and charges nil.

Mid-Cumberland Electricity Co., Ltd.—The nominal capital has been increased by the addition of £50,000 in £1 ordinary shares beyond the registered capital of £250,000. The Electrical Distribution of Yorkshire, Ltd., holds practically the whole of the issued shares.

Neon Luminations, Ltd.—Particulars filed of £3,500 debentures, authorised November 5th, 1937, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Day & Co. (Electrical), Ltd., formerly Day and Co. (Electrical Contractors), Ltd.—D. A. Jacobs, C.A., of 74, Newman Street, E.C., was appointed receiver and manager on November 5th, 1937, under powers contained in mortgage debenture dated September 14th, 1937.

Dicks Wireless & Electrical Factors, Ltd.—H. B. Sachs, of 62-63, Fenchurch Street, E.C.3, ceased to act as receiver and/or manager on July 5th, 1937. (Notice filed November 17th, 1937.)

Bambairtite Battery Co., Ltd.—Capital, £2,000 in £1 shares. Return dated October 18th, 1937. 1,146 shares taken up. £146 paid, £1,000 considered as paid. Mortgages and charges nil.

Parolle Electrical Plant Co., Ltd.—Capital, £500,000 in £1 shares. Return dated September 24th, 1937. 326,750 shares taken up. £326,750 paid. Mortgages and charges nil.

New System Private Telephones, Ltd.—Capital, £20,000 in £1 shares. Return dated June 2nd (filed September 1st, 1937). All shares taken up. £33,000 paid (including £15,000 premium on 5,000 shares), £2,000 considered as paid. Mortgages and charges nil.

B.H. Radio Service & Television, Ltd.—Capital, £600 in £1 shares. Return dated October 18th, 1937. All shares taken up. £600 paid. Mortgages and charges nil.

John Green (Spares), Ltd.—Issue on October 28th, 1937, of £330 debentures, part of a series already registered.

City Notes

Cape Electric Tramways, Ltd., reports a profit for the year ended June 30th, before allowing for depreciation, of £80,239, as compared with £75,185 in the preceding year, from which is deducted debenture interest, interest on deposits, &c., and depreciation on assets of subsidiaries, leaving a net profit of £25,714 (£21,667). To this is added £51,642 brought in. It is proposed to pay a dividend of 5 per cent. (against 4 per cent.), payable in January. The report states that the negotiations with the Cape Town City Council in respect of the reinstatement of roadways and the complete substitution of trolley-buses for trams are nearing completion. These negotiations have resulted in a provisional agreement being entered into with the City Council, in terms of which the subsidiary companies will have security of tenure for twenty years. As regards the removal of the tram rails and reinstatement of streets, the agreement provides that the Council will assume responsibility for the carrying out of this work, and that the liability of the company in respect thereof will be fully discharged on payment to the City Council of £100,000 in twenty equal annual instalments. The board recommends acceptance of the proposals.

Crabtree Electrical Industries, Ltd., held its first annual meeting on November 18th, when Mr. H. F. McLoughlin (chairman), who presided, said that throughout the year under review the operating company (J. A. Crabtree & Co., Ltd.) had continued to work at full productive capacity. The number of employés had increased and additions to plant and extensions of the factory had been carried out. A number of new products were designed and marketed with success and many others were in course of development. Although not directly engaged on rearmament contracts, the operating company was finding extensive application for its standard products in the installation and equipment of the large manufacturing plants which were being developed in consequence of the Government's programme. The overseas market had not been neglected. The steady upward trend in exports had been maintained in the face of the many restrictive conditions obtaining. The outstanding success of the operating company in the past was in no small measure attributable to the anticipation of future trends and requirements by market research.

S. Smith & Sons (Motor Accessories), Ltd.—At the annual meeting on November 18th Mr. W. Henderson-Cleland (chairman), who presided, said that further progress had been made during the year by the K.L.G. Sparking Plug Co. The business of the clock group of companies continued to expand steadily, and satisfactory progress was being made in spite of intense foreign competition. With regard to the future in the K.L.G. Sparking Plug Co., important developments had taken place. After some years of research they had produced a new material for insulators named "Corundite." They anticipated a great future for this sparking plug insulator both for motor-cars and aircraft.

Enfield Rolling Mills, Ltd., reports a net trading profit for the year ended September 30th of £76,085, as compared with £9,136 in the previous year, to which are added dividend on investments £262 and £12,559 from share premium account. From this is deducted £12,750 placed to reserve for obsolescence, £22,398 to depreciation, £11,505 to interest, and £1,181 directors' fees; there is a net profit of £41,074, as against a net loss of £25,851. The debit balance carried forward is reduced from £71,963 to £30,889. The report states that in spite of difficult market conditions the company has a satisfactory volume of orders on hand. Meeting: November 26th.

Tube Investments, Ltd., reports a net profit for the year ended October 31st of £825,090, as compared with £625,882 in the preceding year. Dividends from subsidiary and allied companies totalled £794,774, an increase of £182,768 over the previous year. The final dividend on the ordinary stock is 16½ per cent., less tax, making 23⅔ per cent. (against 17½ per cent.), general reserve receives £100,000 and £128,220 is carried forward. Meeting: December 1st, in Birmingham.

Companies to be Struck Off the Register.—The names of the following companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary:—"Fay" Radio & Recorders, Ltd.; Hanson Electrical Supplies, Ltd.; Metropolitan Electric Wire Co., Ltd.; Beers Radio, Ltd.; Bridge (Croydon) Radio & Engineering Co., Ltd.; British School of Radio, Ltd.; Clements Radio, Ltd.; Porter Radio, Ltd.; Radio & General Products, Ltd.

The Ransome & Marles Bearing Co.—At the annual meeting of this company in October, the chairman indicated that it was the board's intention, after giving effect to the capitalisation of reserves, to issue the remaining £75,000 of the authorised capital of the company when thought fit. The directors have decided to make this issue now. The shares are offered to existing stockholders at 60s. per share in the proportion of one for every £9 of stock held. Of the proceeds of the issue, £225,000, part will be used to complete the programme of extensions to the plant.

The Barbados Electric Supply Corporation reports a net profit for the year ended June 30th of £11,176, as compared with £13,562 in the preceding year, to which is added £2,378 brought in. The dividend is maintained at 6 per cent., tax free, general reserve receives £2,500 and £2,654 is carried forward. The sales of electricity increased from 2,625,485 kWh to 2,844,300 kWh. The effect of reductions in charges to domestic consumers was partly offset by increased business.

Sydney S. Bird & Sons, Ltd., report a net profit for the year ended September 30th, after providing £1,303 for depreciation, of £19,024, from which is deducted the profit earned prior to incorporation of £2,724, leaving £16,300. After charging £150 for directors' fee and providing £4,765 for tax and N.D.C., there is a balance of £11,385 available. The final ordinary dividend is 17½ per cent., less tax, making 25 per cent., and £2,010 is carried forward.

Aktiebolaget Elektrolux, of Stockholm, has decided to utilise part of the undistributed profits carried forward in May last for distributing an interim dividend of kr. 5 per share. It is also intended to make a capital return of kr. 25 per share. The share refund will reduce the capital from 60,000,000 kr. to 45,000,000 kr.

The Chloride Electrical Storage Co. is maintaining the interim dividend on the "A" and "B" ordinary shares at 5 per cent., actual, less tax.

The East India Tramways has declared a final dividend of 6 per cent. on increased capital, making 10 per cent. tax free (against 10 per cent. on old capital).

The Pennsylvania Water & Power Co. has announced a quarterly dividend of $1.50 on the common shares (against $1 a year ago).

Edmundsons Electricity Corporation, Ltd., has declared an interim dividend of 4 per cent., less tax, on the ordinary stock (unchanged).

Stocks and Shares

TUESDAY EVENING.

CONDITIONS this week in the Stock Exchange markets have approached perilously near to the fringe of demoralisation. A spectre of fear has been haunting all the markets. Fear of what, nobody seems to know, but a number of more or less unconvincing explanations are offered to account for the pressure to sell, and the disinclination on the part of capitalists to take the stock offered by people who, either from apprehension or compulsion, are anxious to realise. It goes without saying that the stock markets are full of rumours, repetition of which might be interesting, but would be of no practical service.

A feature of the depression was its widespread character. Ordinarily, if markets are weak, there are at least some few spots that stand out as exceptions to the general sentiment. This time, however, practically all parts of the Stock Exchange became similarly affected, and one seller making many others, the weakness spread through all departments in the house. It speaks volumes for the respect in which electricity supply shares are held that the prices in this department showed little variation. This steadiness implies, of course, that the holders of the shares are of that class which is so content with its investments that it makes no attempt to sell them, even in the dullest of conditions which depress prices elsewhere. The all-round recovery which brightened the markets on Tuesday afternoon in this week went a little way towards wiping out losses that had previously occurred.

New Issues

The present mood of markets is having a naturally chilling effect on would-be borrowers of capital. New issues appear, however, at intervals, and have shown, in several instances, that investment is by no means reluctant to subscribe for stocks and shares which satisfy the ruling desire for a reasonable measure of safety. The latest issue—a Corporation loan—in the gilt-edged market had a good reception and is quoted at a premium. The big Kent Electric 3½ per cent. debenture offer was also a success; the stock stands at a small premium over the prospectus price of 96. There has been no lack of subscribers to such offers of first-class industrial debentures and preference shares as have occasionally come forward to augment dwindling supplies of securities in those categories. The issue of ordinary shares by the Britannia Electric Lamp Company went some way towards overcoming the reluctance of money to leave purely safety-first channels. The 5s. shares are being dealt in at a few pence below the price of 8s. 6d. at which they were offered.

Industrial Markets

Industrial markets have had an unhappy week, with prices in most sections falling away steadily. Part of the weakness can be put down to the normal run of small sales which

have, as is well known, a disproportionate effect on prices at times when buying power is standing aloof. It seems doubtful, however, whether this explanation will serve to account altogether for the latest set-back. Some of the selling is reported to have been of a kind heavy enough to suggest either the necessity or the desire, in some quarters, for liquidity at all costs. A good many scarifying rumours are about. These may have been received by some people with more credulity than would have been the case had nerves not been strained by tension in the political as in the financial world.

Electrical Equipment and Manufacturing

Weakness in industrial markets as a whole has resulted in a wholesale marking down of prices among electrical equipment shares. The cable manufacturing group offered resistance at first, but eventually followed the general trend. Callenders, at 4⅜, have lost half a crown; Enfields and British Insulated—the latter despite reports of a million-pound contract in connection with railway electrification—each lost $\frac{3}{16}$. In other directions, General Electrics have given way from 79s. to 72s., and Associated Electricals from 43s. to 39s. A drop of 6s. 3d., to 45s., in Crompton Parkinsons seems to have little connection with the approach of the report, which is awaited with plenty of confidence. Siemens have had a fall to 27s. 6d., which brings the yield on the last dividend to close on 5¼ per cent. Chloride Electrical Storage have lost 5s., to 70s.; Telegraph Constructions ½, to 2⅛; and Ericssons ¼, to 1⅛. Losses of 1s. upwards are shown by Switchgear & Cowans, 14s. 6d.; Hall Telephones, 23s. 6d.; Walsall Conduits, 23s.; and Reyrolles, 58s. Enfield Rolling Mills, at 14s. 6d., are 2s. down, although expectation was well satisfied with the expansion shown in last week's report. Brush ordinary, at 22½, has fallen five points. This recital would be melancholy indeed were it not for the brighter tendency, already mentioned, which was in evidence at the close of business on Tuesday of this week.

American Conditions

The dejected appearance of Wall Street reflects continued concern over the trend of business activity in the United States. Optimism put in a brief reappearance on Mr. Roosevelt's slight unbending towards the utility companies, but it retired discouraged by the President's subsequent address to Congress. Hopes of definite concessions to the business community were given little more to feed on than a vague recognition of the desirability for stimulating private enterprise. No sign was given of a relenting attitude regarding the unpopular taxes on capital gains or company reserves. Meanwhile, American industry protests the louder concerning its inability to expand under conditions which offer little inducement to capital to come out of hiding. Investors, aware of the importance of America's well-being to this country's trade, would be happier to see some relaxation of the restrictions which appear to be hampering the wheels of industry in that country. What is likely to be the result, to individual branches of industry, of the intended Anglo-American trade agreement forms the theme of lively discussion. It is too early to form anything but a guess at the manner in which such a pact would operate, but Stock Exchange markets are prone to discount happenings in advance of any event.

Brazilian Affairs

South America has lately added to the general discomfiture of markets by way of the new Brazilian Dictator's pronouncements regarding, amongst other things, the interest upon his country's foreign debt service. The intention now is to suspend the payments pending an investigation into Brazil's capacity to meet her obligations. Dealings in London in Brazilian bonds have been resumed, though on a much reduced basis. Meanwhile, the behaviour of the price of Brazilian Traction shares is a rough index to the general feeling regarding the probable future, under the new conditions, of private enterprise controlled by non-Brazilian money. The price of Brazilian Tractions had been knocked down by about 6 dollars, to 11¼, on the first shock. After recovering to 13⅜, on a false report that Dr. Vargas had modified his attitude, the quotation has again fallen to under 12. This suggests a certain amount of nervousness regarding possible dictatorial interference with companies in which British and other outside money is invested.

Miscellaneous Matters

The gilt-edged market remains hard, although the steady rise in prices is, for the moment, at a halt. Electricity supply shares are among the few firm spots in the yielding industrial market. Cable and Wireless ordinary took a new plunge, to 60½, a fall of 6 points. The 5½ per cent. preference stock is 2 points down, at 99½. Little fault can be found with the last-published index figure, but the market has proved vulnerable to the depression produced by general conditions. Marconi Marines, at 28s. 9d., are again 2s. 6d. lower. In the traction department, British Electric Traction deferred stock, at £900, shows a loss of 175 points. Even the tightly held 8 per cent. preferred, which rarely changes its price, has gone back 5 to 160. At this the yield comes to 5 per cent. and the security is amply protected by the company's earnings. Engineering shares are weak. Babcocks dropped to 40s. The price of rubber, like the quotations for various base metals, has eased off, and the share markets sympathetically responded to this dullness.

Share List of Electrical Companies

	Dividend. Nom.	Previous.	Last.	Price Nov. 23.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	67/6	—	4 9 9
City of London	1	7½	7½	34/6	—	4 7 0
Clyde Valley	1	7	8	2	—	4 0 0
County of London	1	10½	10½	48/-	−1/-	4 7 6
Edmundson's 7% Pref.	1	7	7	33/6	—	4 3 7
Do. Ord.	1	8	9	38/-	−1/-	4 14 9
Elec. Dis. Yorkshire	1	9	9	41/6	—	4 6 10
Elec. Fin. and Securities	1	12½	12½	2⅝	—	4 15 3
Elec. Supply Corporation	1	11	12	52/-	—	4 12 5
Lancs Light and Power	1	7½	7½	33/-	—	4 11 0
Lond. Assoc. Electric	1	—	7	31/3	—	4 9 6
London Electric	1	7	8	35/6	—	4 10 2
London Power Deb. Red.	Stock	5	5	106½	—	4 14 0
Metropolitan	1	10	10	45/-	−1/-	4 9 0
Midland Counties	1	7½	8	36/6	−1/-	4 7 6
Mid. Elec. Power	1	8	9	2¼	—	4 4 8
North Eastern Electric Ordinary	1	6	7	31/-	−1/-	4 7 6
Do. 7% Pref.	1	7	7	34/-	—	4 2 4
Northampton	1	10	10	45/-	—	4 9 2
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	46/3	−2/-	4 6 6
Do. do. 6% Pref.	1	6	6	30/-	—	4 0 0
Scottish Power	1	8	8	36/6	−6d.	4 7 6
South London	1	7	7	32/-	—	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	−1/-	7 10 0
Yorkshire Elec.	1	8	8	39/6	−6d.	4 1 0
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	113	—	4 8 6
Do. 1955–75	,,	5	5	115	—	4 7 0
Do. 1951–73	,,	4½	4½	110	—	4 1 10
Do. 1963–93	,,	—	3½	98	—	3 11 5
London Elec. Trans. Gtd.	,,	—	2½	90	—	2 15 8
London & Home Counties, 1955–75	,,	4½	4½	109	—	4 2 7
London Passenger Transport, A	,,	—	4½	117½	+1	3 16 9
Do. do. B	,,	—	5	120½	—	4 3 1
Do. do. C	,,	4	4½	81	—	5 5 0
West Midlands Joint Elec. 1948–68	,,	—	5	112	—	4 9 3
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$160	9	9	145½	−7	6 3 9
Anglo-Am. Tel. Pref.	Stock	6	6	115½	—	5 4 0
Do. Def.	,,	1½	1½	28½	—	5 5 3
Cable & Wireless 5½% Pref.	,,	4⅝	5½	99½	−2	5 10 5
Do. Ord.	,,	—	—	60½	−6	—
Do. Income	,,	—	—	101½	—	3 18 10
Globe Tel. & Tel. Ord.	10	4½*	5½*	14⅜	−1	3 14 8
Do. do. Pref.	10	6	6	13⅞	−⅛	4 6 6
Great Northern Tel.	10	20	20	38	—	5 5 3
Marconi-Marine	1	10	7½	28/9	−⅛	5 4 4
Oriental Telephone Ord.	1	12*	12*	2⅞	—	4 3 6
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	5/-	−⅛	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	15½	−2	—
British Electric Traction Def. Ord.	,,	5	5	900	−175	—
Do. do. Pref. Ord.	,,	8	8	160	−5	5 0 0
Brazil Traction	$100	40 cts.	50 cts.	11⅞	−1	—
Brit. Columbia Elec. Rly. Pfd.	Stock	5	5	106½	—	4 14 9
Mexican Light Common	$100	Nil	Nil	2	—	—
Do. 1st Bonds	$500	5	5	35	+2	—
Victoria Falls Ord.	1	20	12	2⅛	−⅛	4 5 5
West Riding	1	6½	10	2	—	5 0 0
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	15	15	2½	−⅛	7 0 10
Assoc. Elec. Ord.	1	8	10	39/-	−4/-	5 2 7
Do. Pref.	1	8	8	37/6	—	4 5 3
Babcock & Wilcox	1	8	10	2	−2/-	5 0 0
British Aluminium Ord.	1	7½	10	41/3	−4/6	4 17 0
British Insulated Ord.	Stock	20	20	4	−⅛	4 10 1
Brush Ord.	Stock	Nil	Nil	22½	−5	—
Callender's	1	15	15	4⅜	−⅛	3 8 8
Do. 6½% Pref.	1	6½	6½	31/3	—	4 2 4
Crompton Parkinson Ord.	5/-	12½	12½	2½	−⅛	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	7	10	1	−⅛	5 10 4
Enfield Cable Ord.	1	25	25	4	−⅛	5 1 8
English Electric	1	Nil	Nil	28/-	−2/-	—
Do. do. Pref.	1	6½	6½	26/0	−6d.	5 0 0
Ericsson Tel.	5/-	20	25	1⅞	−⅛	3 6 8
Ever Ready	5/-	35	45	28/0	−6d.	8 0 9
Ferranti Pref.	1	7	7	27/6	—	5 1 10
G.E.C. Pref.	1	6½	6½	31/3	—	4 0 0
Do. Ord.	1	15	17½	72/-	−7/-	4 17 3
Henley's	5/-	30	15	18/3	−1/9	4 2 0
Do. 4½% Pref.	1	4½	4½	1½	—	4 0 0
India-Rubber Pref.	1	5½	5½	21/3	—	5 3 6
Johnson & Phillips	1	⅛	10	42/6	—	4 14 1
Lancashire Dynamo	1	10	20	3⅜	—	5 18 6
Siemens Ord.	1	6	7½	27/6	−⅛	5 9 0
Telegraph Construction	£1	Nil	7½	2⅛	−⅛	3 10 7

* Dividends are paid free of Income Tax

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1935

24366. "Dry batteries." F. MacCallum and A. H. Redfern. January 31st, 1936 (Addition to 423165). (474151.)

1936

2313. "Electrically actuated measuring or indicating devices." E. Billig and Hackbridge Electric Construction Co., Ltd. January 24th, 1936. (474186.)

2319. "Rotary electric couplings." B. Lee and F. P. Bevis. January 24th, 1936. (Addition to 453360.) (474073.)

2320. "Electrical coupling devices." B. Lee and F. P. Bevis. January 24th, 1936. (474074.)

5658. "Automatic testing and delivery cabinet for electric batteries." S. G. Brown. February 25th, 1936. (474078.)

9011. "Means for controlling arc convertors." English Electric Co., Ltd., R. D. Ball and J. E. Calverley. March 26th, 1936. (474155.)

11381. "Electric motor control systems." English Electric Co., Ltd., H. S. Carnegie and A. E. Rogers. April 21st, 1936. (474287.)

11804. "Alternating-current metal-vapour arc rectifiers." O. Brunnquell. April 25th, 1935. (474292.)

12064. "Electron-discharge devices." Baird Television, Ltd., T. M. C. Lance and V. Jones. April 28th, 1936. (474296.)

12066. "Manufacture of luminescent materials, and means for illumination comprising them." General Electric Co., Ltd., A. H. McKeag, and J. T. Randall. April 28th, 1936. (474297.)

12067. "Electric-discharge lamps comprising luminescent materials." General Electric Co., Ltd., R. L. Breadner, J. T. Randall and J. W. Ryde. April 28th, 1936. (Cognate application 20444/36.) (474298.)

12115. "Electrical apparatus for motor vehicles, having a plurality of driving motors." R. Bosch, Akt.-Ges. April 29th, 1935. (474372.)

12166. "Shades and mountings for electric lamps." I. Gluckstein. April 29th, 1936. (474246.)

12208. "Radio direction-finders." Marconi's Wireless Telegraph Co., Ltd., and G. M. Wright. April 29th, 1936. (474380.)

12209. "Jointing of electric high-frequency concentric feeders." Marconi's Wireless Telegraph Co., Ltd., and W. S. L. Tringham. April 29th, 1936. (474381.)

12210. "High-frequency circuit arrangements." Marconi's Wireless Telegraph Co., Ltd., N. M. Rust and E. F. Goodenough. April 29th, 1936. (474382.)

12211. "High-frequency electrical energy transferring, transforming, coupling and like networks." Marconi's Wireless Telegraph Co., Ltd., and E. Green. April 29th, 1936. (474383.)

12213. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd., and G. F. Brett. April 29th, 1936. (Addition to 403973.) (474084.)

12214. "Radio and other high-frequency feeder arrangements." Marconi's Wireless Telegraph Co., Ltd., C. S. Franklin. April 29th, 1936. (474385.)

12216. "Television and the like receivers." Marconi's Wireless Telegraph Co., Ltd., D. L. Plaistowe. April 29th, 1936. (474386.)

12217. "Piezo-electric crystal circuit arrangements." Marconi's Wireless Telegraph Co., Ltd., and N. M. Rust. April 29th, 1936. (474387.)

12218. "Electrical frequency-dividing circuit arrangements." Marconi's Wireless Telegraph Co., Ltd., and D. A. Bell. April 29th, 1936. (474388.)

12231. "Electric clocks." J. E. Pollak. (G. W. Borg Corporation.) April 29th, 1936. (474389.)

12249. "Electric synchronous motor clocks with striking attachment." J. W. Webb. April 30th, 1936. (474427.)

12279. "Electron-discharge devices." Baird Television, Ltd., and C. Szegho. April 30th, 1936. (474391.)

12318. "Sealing of metal wires into vitreous envelopes." Siemens Electric Lamps & Supplies, Ltd., and J. N. Aldington. April 30th, 1936. (474394.)

12325. "Alternating-current signalling systems." L. E. Ryall. April 30th, 1936. (474428.)

12326. "Electric welding machines." British Thomson-Houston Co., Ltd. April 30th, 1935. (474247.)

12353. "Electric motor control systems." General Electric Co., Ltd., and E. H. Croft. April 30th, 1936. (474430.)

12393. "Dynamo-regulators." C.A.V.-Bosch, Ltd., W. H. Glaser and N. R. Wood. May 1st, 1936. (474398.)

12407. "Television or like receivers." Baird Television, Ltd., and L. R. Merdler. May 1st, 1936. (474399.)

12403. "Discharge tube." Radioakt-Ges. D. S. Loewe. May 3rd, 1935. (474400.)

12459. "Variable resistances and like devices." Standard Telephones and Cables, Ltd., and W. H. M. Hellier. May 1st, 1936. (474406.)

14680. "Electric light for locating defects, stoppages and breakages in drains or sewers." E. F. Chapple. May 25th, 1936. (474088.)

14684. "Control of electrically operated lifts." General Electric Co., Ltd., and N. C. Smart. February 19th, 1937. (474089.)

15432. "Windings for induction machines." V. Kauders. June 2nd, 1936. (474258.)

16945. "Control knob or handle combined with an electric switch." C. F. Batten, and H. R. Batten. June 18th, 1936. (474262.)

18522. "Electric-discharge devices." General Electric Co., Ltd., and D. G. Prinz. July 3rd, 1936. (474264.)

18804. "Telephone systems." General Electric Co., Ltd., and O. I. Carpenter. July 7th, 1936. (474265.)

19198. "Rectifier systems for television purposes." Radioakt-Ges. D. S. Loewe. July 11th, 1935. (474266.)

21253. "Delay-action or timing devices, particularly suitable for use in connection with electric control apparatus." W. H. Scott. July 31st, 1936. (474310.)

21717. "Radio and like transmitters." Marconi's Wireless Telegraph Co., Ltd. August 31st, 1935. (474311.)

25847. "Silencing devices in wireless receiving sets." General Electric Co., Ltd., J. O. Ackroyd, A. J. Biggs and E. B. B. Callick. September 23rd, 1936. (474104.)

26774. "Indirectly heated high-voltage cathodes for electric-discharge devices." Radioakt-Ges. D. S. Loewe. October 2nd, 1935. (474179.)

27920. "Electric arc furnaces." I. G. Farbenindustrie Akt.-Ges. December 7th, 1935. (474317.)

28090. "Electric circuit-breakers." F. Strauss (née Ruppel). October 15th, 1935. (474180.)

28981. "Insulated electrical conductor." Rockbestos Products Corporation. October 24th, 1935. (474108.)

32425. "Electric cables." Felten and Guilleaume Carlswerk Akt.-Ges. December 18th, 1935. (Addition to 468325.) (474115.)

32834. "Piezo-electrical crystal apparatus." Marconi's Wireless Telegraph Co., Ltd. November 30th, 1935. (Cognate application, 32835/35.) (474183.)

33051. "Flexible high-frequency electric cables." Felten and Guilleaume Carlswerk Akt.-Ges. December 2nd, 1935. (474116.)

33328. "Electric switches having arc-quenching arrangements." British Thomson-Houston Co., Ltd. December 5th, 1935. (474185.)

33977. "Means for mounting electric immersion-heaters in containers." L. P. Haussauer. December 10th, 1936. (474324.)

35876. "Teleprinters." Autophon Akt.-Ges. January 2nd, 1936. (474329.)

1937

859. "Process of manufacturing dry rectifiers." E. Barrey. January 16th, 1936. (Cognate application 860/37.) (474277.)

1970. "High-pressure mercury-vapour discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 24th, 1936. (474192.)

2018. "Single-phase electric motors." M. Stalder. January 23rd, 1936. (474193.)

4302. "Piezo-electric apparatus." Standard Telephones and Cables, Ltd. February 19th, 1936. (474337.)

4451. "Electric water-heaters." L. Kellner, M. Kellner and V. Gebert. February 15th, 1937. (474194.)

6231. "Devices for rectifying by means of interrupters actuated synchronously with the alternating-current supply mains." Siemens-Schuckertwerke Akt.-Ges. March 2nd, 1936. (474197.)

6616. "Electric bonds for rail joints." E. A. Everett. March 5th, 1937. (474132.)

6622. "Thermionic amplifiers." Philco Radio and Television Corporation. March 23rd, 1936. (474133.)

6989. "Variable resistance or potentiometer." Steatit-Magnesia Akt.-Ges. March 9th, 1936. (474200.)

7697. "Lighting-apparatus for hospital operating-theatres and like places." Holophane, Ltd. March 16th, 1937. (474344.)

7877. "Single-phase mercury-vapour rectifier valves." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 20th, 1936. (Addition to 456243.) (474203.)

8011. "Sealed leading-in connections for electrical apparatus." British Thomson-Houston Co., Ltd. March 18th, 1936. (474138.)

8372. "Boxes for inductance coils having an adjustable core." Fabrica Italiana Magneti Marelli. March 28th, 1936. (474345.)

9534. "Methods of testing electric circuit breakers." British Thomson-Houston Co., Ltd. April 3rd, 1936. (474140.)

9623. "Luminairs." Holophane, Ltd. (T. W. Rolph.) April 5th, 1937. (474141.)

9805. "Electric transformers." British Thomson-Houston Co., Ltd. April 6th, 1936. (Addition to 470145.) (474209.)

9922. "Electric circuit elements." Steatit-Magnesia Akt.-Ges. April 8th, 1936. (474210.)

11685. "Reflecting arrangements for ultra-short wave signalling systems." Standard Telephones and Cables, Ltd. June 26th, 1936. (474214.)

11688. "Junction boxes for insulating cables." R. V. Macrory. April 23rd, 1937. (474350.)

12943. "Electric motor controllers." Igranic Electric Co., Ltd. May 11th, 1936. (474149.)

13942. "Centrifugal switches." Maschinenfabrik Oerlikon. June 18th, 1936. (474218.)

14102. "Circuit arrangement for telephone pay-stations for variously rated calls." Telephon-Apparat-Fabrik E. Zwietusch and Co. Ges. December 24th, 1936. (474351.)

14508. "Centrifugal switches." Maschinenfabrik Oerlikon. June 23rd, 1936. (474220.)

16464. "High-frequency signal receiving systems." British Thomson-Houston Co., Ltd. June 13th, 1936. (474356.)

20254. "Resistance arrangements for film projectors." Siemens and Halske Akt.-Ges. July 27th, 1936. (474222.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one week from November 17th :—

Pilot Radio (lettering and design). No. 579697. Class 8. Radio receiving sets.—Pilot Radio, Ltd., 87, Park Royal Road, N.W.10.

Motovia. No. 579700. Class 8. Wireless telegraphic and telephonic receiving apparatus and parts thereof.—Eric J. C. S. St. John Chesney, 38, High Street, Westminster, S.W.1.

Magnite. No. 580140. Class 8. Electric cables.—Magna Wire and Cable Co., Ltd., 87, Southwark Street, S.E.1.

Monarch. No. 575970. Class 13. Electric lamps (ordinary), electric lighting fittings for use in street and public lighting and headlamps for cars.—The Walmsley Patent Lamp Co., Ltd., 180, Gray's Inn Road, W.C.1.

Resicord. No. 577433. Class 50. Mouldable compositions comprising fibrous materials impregnated with synthetic resin, and sheets, rods and tubes made from such compositions.—Bakelite, Ltd., 68, Victoria Street, Westminster, S.W.1.

Texolex. No. 578544. Class 50. Compositions of cotton or asbestos fibres impregnated with artificial resin sold in sheets, rods or tubes, and articles made therefrom.—The Bushing Co., Ltd., South Drive, Hebburn, Durham.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barking.—Extension to factory, River Road; Forrest Printing Ink Co., Ltd.

Barnsley.—Schools (£23,000) for the Catholic Authorities of St. Joseph's; Dyson, Cawthorne & Coles, architects, Regent Street.

Beckenham.—Maternity home, Stone Park Avenue (£41,793); W. E. & S. Rumph (Builders), Ltd., Bromley.

Becontree.—Factory, Albion Road; A. Ornstin, Ltd.

Birmingham.—Three-storey factory (£50,000), Slaney Street, for Lucas Engraving Co., Ltd.; William Wilkinson, Ltd., builders, Hutton Road. School, Hatchford Brook, Sheldon; J. A. Swan, architect, 33, Paradise Street, Birmingham. School, Ridpool Road, Yardley; W. T. Benslyn, architect, Education Offices. Extensions to works for Universal Woodworking Co., Ltd.; J. Bowen & Sons, contractors, George Street, Balsall Heath.

Braintree.—Dwellings (144), eight parishes; financial officer of the Council, St. Peter's Close, Bocking, Braintree.

Bristol.—School, King's Weston; governors, Queen Elizabeth's Hospital.

Brixton.—Flats (965), Tulse Hill (£657,800); L.C.C. architect, County Hall, Westminster Bridge, S.E.1.

Bucknall (STAFFORDSHIRE).—Land development, Fellbrook Lane; Northmere Building Co.

Bungay.—School; county architect, 9, Burlington Road, Ipswich.

Castle Bromwich.—Shops and houses, Chester Road; R. Burfell, Ltd., builders, Chester Road, Birmingham.

Cobridge (STAFFORDSHIRE).—Development of Grange estate; J. E. Homer.

Coventry.—Factory, Foleshill, for the Standard Motor Co., Ltd., Canley; T. R. J. Meakin, architect, 11, Warwick Row.

Devonshire.—School, Sidmouth; H. V. de Courcy Hague, architect, 97, Heavitree Road, Exeter.

Edinburgh.—Houses (64), Iona Street, for Corporation; city architect. Houses (75), Pirniefield Place and Grove, Leith; James Millar & Partners, Ltd., builders. Two additional wings (£8,000), Animals Diseases Research Association Buildings, Moredun Institute, Gilmerton; the superintendent.

Edmonton.—Houses (119), Firs Lane; Hilbery Chaplin, Ltd., Estate Office, Mollinson Way, Stag Lane Aerodrome, Edgware.

Ely.—Shops and offices, High Street; R. J. Sergeant.

Essex.—Clinic, Upminster, and schools, Hedingham, Upminster, and Upshire; county architect.

Fence Houses.—Cinema, Front Street; North Eastern Cinemas-de-Luxe, Ltd.

Finchley.—Flats (28), East End Road; Hillier, Parker, May & Rowden, 27, Maddox Street, London, W.1.

Fishburn-on-Tees.—Houses (30), Chaytor Terrace; Hudson & Knotts.

Gateshead-on-Tyne.—Houses (48), Chowdene estate, and factory, Great North Road, for Domestos, Ltd.; A. H. Fennell & Co., architects, 16, West Street. Banking premises for Barclays Bank, Ltd., and fire station, Team Valley estate; L. J. Couves and Partners, architects, Carliol House, Newcastle-on-Tyne. Factory, Team Valley estate, for Perge, Ltd.; W. B. Edwards, architect, 32, Eldon Place, Newcastle-on-Tyne. Offices and stores, Hawks Road, for Lumsden Machine Co., Ltd.

Glasgow.—Glasgow Pavilion, Empire Exhibition, for Corporation; city architect. Hostel for the London, Midland and Scottish Railway Co.; J. Green & Co., Ltd., contractors, 219, St. Vincent Street, Blythswood. Pattern shop, Clyde Foundry, for Harland & Wolff, Ltd.; Hobart and Heron, architects, Belfast, Northern Ireland.

Gomersal.—Premises for Martins Bank, Ltd., 7, Water Street, Liverpool; F. Cave, architect, High Street, Heckmondwike.

Hamilton.—Cinema, for Odeon Theatres, Ltd.

Hampshire.—Isolation hospital, Coldeast, and police court and station, Junction Road, Andover, for the County Council.

Havant.—Cinema, East Street, for Union Cinemas, Ltd.; F. Small, contractor, Fareham, Hampshire.

High Wycombe.—Houses (20), Rupert Avenue; H. E. Bird, builder, Wycombe Marsh. Factory, Grafton Street, for Bonnett & Ford, Grafton Street.

Hornsey.—Extensions to Town Hall (£23,502); borough engineer.

Hull.—Office and shop block, Jameson Street; Morris De Metz, architect, 13, Devonshire Terrace, London, W.1.

Kent.—Nurses' home, Barming (£15,000); county architect.

Kidderminster.—Extensions to factory, for Brintons, Ltd., Corporation Street.

Kiveton Park.—Houses and bungalows; W. M. Gibson, R.D.C. surveyor.

Lancashire.—Clinics, Fleetwood, Haydock, Thornton, and extensions to Greenfield massage clinic, Haslingden, for the County Council.

Lancaster.—Houses (206), Hare Runs estate (contract No. 2); F. Hill, city surveyor, Town Hall.

Leeds.—Offices (£100,000), New Gallery Ballroom, South Parade site, for The Friends Provident and Century Life Office.

Lincoln.—Houses and bungalows, St. Giles, Monk Tower, and Moorland Avenue estates; surveyor, Council Offices, Lincoln.

Lincolnshire. — School, Burton-on-Stather, Scunthorpe; County Council, County Offices, Newland, Lincoln.

Littlehampton.—Café (£11,700), Sunken Garden; U.D.C. surveyor.

Liverpool.—Works, Edgrove, for Sumner Engineering Co., Ltd., Fairfield Street; H. C. Killender, architect, 62, Dale Street.

London.—(ST. PANCRAS).—Rehousing scheme, Camden Rd.; L.C.C. architect, County Hall, Westminster Bridge, S.E.1. (SOUTHWARK).—Extensions to Guy's hospital; Thompson & Walford, architects, Leadenhall Buildings, Leadenhall Street, London, E.C.3. (PADDINGTON).—Cinema and shops, Westbourne Grove; A. Mather, Leicester Square Chambers, Leicester Square, W.C.2.

Manchester.—Reconstruction of Princes Theatre (£20,000); manager.

Meir (STAFFORDSHIRE).—Shops, Sandon Road; Modern Architectural Estates, Ltd.

Middlesbrough.—Cinema, Acklam Road, for N. King; Kitching & Co., architects, 21, Albert Road.

Millom.—Factory for Millom Tannery Co.

Morley.—Houses (48), Church Farm estate, Gildersome; J. S. Bramley & Sons, Ltd., East Ardsley, near Wakefield.

Newbury.—Houses (41), Pyle Hill estate; J. W. Palmer.

Newcastle-on-Tyne.—Houses, in flats, Bosworth Gardens, &c.; J. J. Hedley, builder, Crawhall Road. School, for the Education Committee; J. Harvey, architect, Northumberland Road. School (£100,000). Whickham View, for the E.C.; B. Peel, Ltd., builders, North Shields.

Newport (SHROPSHIRE).—Extensions to grammar school (£12,000); Governors.

Northern Ireland.—(BELFAST).—Extensions to factory, for Ulster Weaving Co.; W. D. R. & R. T. Taggart, architects, 2, Wellington Place. Houses (34), Kingsberry Park; J. Guthrie, architect, Belfast.

Pendlebury.—Houses (60), Rake Lane; T. E. Hamer, 222, Rake Lane, Clifton.

Prescot.—Shops and houses, Essonwood Road, Whiston; B. Johnson, builder, Essonwood Road, Whiston.

Rainham.—Cinema, site of old Vicarage, for E. E. Jerman, owner of Palace Cinema, Tilbury.

Rawmarsh.—Houses (98); G. W. Meanley & Sons, Ltd., builders, Melton Park, Doncaster.

Redditch.—Development of Riverside Park estate; Redditch Land Development Co. Factory, Arthur Street; B.S.A. Co.

Renfrew.—Houses (42), Wright Street; John Lawrence (Glasgow), Ltd.

Renfrewshire.—Eight factories, industrial estate, Hillington, for Scottish Industrial Estates, Ltd.; the secretary, 41, St. Vincent Place, Glasgow.

Rochester.—School (£50,000), Cliffe Road, Frindsbury, for E.C.

Sale.—Houses (20), near Harborough Road West, Ashton-on-Mersey; J. & J. Neale, builders, Ivy Farm, Firs Road, Ashton-on-Mersey.

Sidcup.—Houses (38), near Woodbine Road; Ideal Property Trust, 219, Blackfen Road, Sidcup.

Solihull.—Extension to Solihull and Meriden Isolation Hospital (£25,000); Councillor H. I. Pedley, chairman of the Hospital Committee.

Spenborough.—Houses (30), on Firthcliffe site, Liversedge; A. Rothera, architect, Church Street, Cleckheaton.

Staines.—Cinema, for Associated British Cinemas, Ltd.

Stockport.—Houses (500), Savages Farm estate; W. F. Gardner, borough surveyor.

Stockton-on-Tees.—Houses (195); G. P. Stainsby, architect, 25, High Street. Houses (14), Weston Crescent; A. E. Hobbs, builder, Hill House, Norton-on-Tees.

Thatcham (BERKSHIRE).—Houses (46), near Henwick Lane; J. Wilson.

Walton-le-Dale. — Houses (62), Mounsey Road, Bamber Bridge; Bowden & Chadderton.

Warwickshire.—Schools, Hasluck Green Road, Shipley, Rugby, Wilnecote, and completion of Technical college, Rugby (£140,000), also extensions to school, Chapel Fields, Olton (£7,600), for the County E.C. Extensions to County office, Warwick (£18,750); county architect.

Wednesbury.—School, Crewe Road (£17,927), for the E.C.

Wellingborough.—Factory, Weavers Road, for Ideal Clothiers, Ltd.

West Hartlepool.—Houses (58), Old Town area; Fordy & Sons, builders, Stockton-on-Tees.

Whitley Bay.—Swimming baths and gymnasium; U.D.C. surveyor.

Winchester.—Extensions to county offices (£132,500); C. Cowles-Voysey, architect.

Yorkshire.—Enlargement of school, Maltby (£12,228), for the West Riding E.C.

Awards to Inventors

The final report of the Royal Commission on Awards to Inventors was issued last week. This Commission was appointed under the chairmanship of the late Lord Tomlin in 1919 to deal with claims in respect of the user of inventions on behalf of the Crown. It received 1,834 applications, of which 369 were dealt with by the Commission direct, the rest being considered in the first instance by an Investigating Committee. The total amount awarded to inventors has been £1,500,000, apart from payments awarded on a royalty basis. The expenses of the Commission have amounted to £27,596. Appended to the report is the final list of recommendations, covering the period from July 1st, 1931, to the end of the Commission's sessions; these include the following:—Messrs. L. J. Steele, H. Martin, A. E. Franklin, and Mrs. A. E. McCarthy (executrix of A. E. McCarthy, deceased), eye-arc welding apparatus (£500); Capt. H. J. Round, M.C., wireless direction finding apparatus (£1,000); and Mr. C. F. Hilton, telegraph receiving apparatus (£225).